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2000 CORRECTIVE ACTION EFFECTIVENESS MONITORING ANNUAL REPORT

GENERAL ELECTRIC COMPANY
BRIDGEVILLE GLASS PLANT

February 2001

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Section 1
Introduction

This annual report summarizes the results of corrective action groundwater monitoring activities conducted at the General Electric Company Bridgeville Glass Plant (GE-Bridgeville) in Bridgeville, Pennsylvania, in 2000. GE-Bridgeville conducts semiannual groundwater sampling at the site in March and September of each year. In addition, groundwater elevation data is collected quarterly during the year. Reports of corrective action monitoring activities are submitted to the United States Environmental Protection Agency (USEPA) on an annual basis. This annual report presents a summary of the semiannual groundwater sampling events conducted in March and September 2000 and the groundwater elevation data collected in March, June, September, and December 2000.

1.1 Background

GE-Bridgeville is a manufacturer of glass tubing used in the manufacture of light bulbs. The facility is located north of Bridgeville in Allegheny County, Pennsylvania. The facility was originally built in 1907 and operated by the Higbee Glass Company. GE purchased the facility in 1919. Historically (1919 through 1979), the facility disposed of its industrial wastes in an on-site landfill. The fill material consists of cinders, off-spec glass, refractory brick, air emissions control dust, and debris from plant operations. Some of these materials are considered Resource Conservation and Recovery Act (RCRA) hazardous under the D006 and D008 waste codes. A groundwater quality assessment conducted in 1986 as a result of the facility's Part B permitting process indicated impact to groundwater from the landfill.

GE-Bridgeville performs groundwater monitoring of the surficial aquifer beneath the facility to address corrective action requirements as specified by 40 CFR § 264.101. Corrective action measures related to the on-site solid waste landfill were completed in 1992. The corrective measures included construction of a surface asphalt/concrete cap, installation of a groundwater recovery trench, and construction of a sheetpile wall adjacent to Chartiers Creek. Facility groundwater monitoring was initiated in accordance with the Hazardous and Solid Waste Amendment Act (HSWA) Permit for Corrective Action for the landfill issued by USEPA Region III in October 1990. The facility's original HSWA permit was subsequently modified in November 1992, May and December 1993, and April 1998. Modifications included changing the monitoring well sampling frequency from quarterly to semiannually and revising the groundwater monitoring parameter list. The site-specific parameter list was modified to consist of pH and total and dissolved arsenic, barium, cadmium, chromium, and lead.

Chloride, phenols, sulfate, specific conductance (SC), total organic carbon (TOC), total organic halogens (TOX), total petroleum hydrocarbons (TPH), total sodium, and total and dissolved iron and manganese were removed from the previous list of parameters.

Under the conditions of the April 1998 modified HSWA permit, facility groundwater sampling is conducted semiannually to evaluate groundwater quality in the surficial aquifer underlying the GE-Bridgeville facility. Groundwater samples are collected from facility wells, including background monitoring wells, to meet facility corrective action groundwater monitoring requirements.

1.2 Facility Description

The GE-Bridgeville site encompasses approximately 10 acres and is generally flat. Site elevations, excluding the Chartiers Creek floodplain area, range from 802 feet to 811 feet National Geodetic Vertical Datum (NGVD). The site is bounded to the north by Mayer Street and a Wheeling and Lake Erie railroad track. Chartiers Creek and a Conrail railroad track are located to the south and southwest of the site, and a partially abandoned Universal Cyclops steel mill is located to the east. A three-story brick manufacturing building with offices and an asphalt parking area occupy the northwestern portion of the site.

The central portion of the site is occupied by a landfill. The surface area of the landfill is approximately 3.6 acres with a variable thickness of five to ten feet. The southern portion of the landfill is immediately adjacent to Chartiers Creek. Much of the landfill area is an integral part of plant operations including truck parking and turn-around, raw material unloading, material storage, and hazardous waste storage. Formerly, propane and fuel oil were also stored in this area.

The southwestern portion of the property is primarily a floodplain area adjacent to Chartiers Creek and is wooded. Chartiers Creek is a meandering stream that flows in a southerly direction and ultimately discharges into the Ohio River. The distance from the plant to the confluence of Chartiers Creek and the Ohio River is approximately 12 miles.

1.3 Monitoring Wells

The facility corrective action groundwater monitoring program currently includes a system of seven corrective action effectiveness monitoring (CAEM) wells screened in subsurface materials located beneath and downgradient of the landfill and four supplemental monitoring wells. Three of the supplemental monitoring wells, MW-02, MW-16, and MW-17, are located upgradient of the landfill, and one well, MW-21, is located off-site across Chartiers Creek. These eleven wells are located to monitor the effectiveness of corrective action measures

completed in 1992 related to the on-site solid waste landfill designated as a solid waste management unit (SWMU). Two additional wells, MW-01R and MW-15R, are included as monitoring locations indicative of background conditions of the water-bearing zone. Six performance monitoring wells are utilized to evaluate groundwater elevation within the fill material. Table 1-1 lists the 19 facility monitoring wells.

1.4 Purpose

The purpose of this report is to summarize the results of the corrective action groundwater monitoring activities conducted at GE-Bridgeville in 2000 in accordance with the HSWA Permit issued for the site and the Final Permit Modifications issued in April 1998 by USEPA. This permit addresses corrective action requirements specified by 40 CFR § 264.101. The permit requires the facility to report the following information no later than March 1 following each calendar year:

- Concentrations or values of each parameter listed in the permit for each alluvial groundwater quality monitoring well
- Statistically significant exceedance of the applicable compliance limit for each constituent in each CAEM well located beneath and downgradient of the landfill
- Results of an evaluation of groundwater elevations in each of the performance monitoring wells

In addition, this report includes a discussion of trends in groundwater conditions observed in the supplemental wells located upgradient of the landfill and a comparison of constituent concentrations detected in CAEM and supplemental wells during 2000 to applicable Maximum Contaminant Levels (MCLs).

1.5 Methods and Scope

Groundwater samples and water level measurements were collected following protocols outlined in the USEPA-approved *Quality Assurance Project Plan* (QAPP; Law, October 31, 1995). Groundwater samples and water level measurements were collected by Chester Engineers (Chester) of Pittsburgh, Pennsylvania for the semiannual groundwater sampling and quarterly water level measurement events. Groundwater samples collected from the CAEM and supplemental monitoring wells were shipped to En Chem, Inc. (En Chem) in Madison, Wisconsin for analysis. This report of these activities has been prepared by RMT, Inc. (RMT) in Atlanta, Georgia.

1.6 Analytical Program

Groundwater samples are collected semiannually from the 13 alluvial groundwater quality monitoring wells. These samples are analyzed in accordance with the USEPA-approved QAPP. Samples are collected from monitoring wells that are both upgradient and downgradient of the landfill. Groundwater samples are analyzed for the indicator parameter pH and the five inorganic parameters arsenic, barium, cadmium, chromium, and lead. Table 1-2 lists parameters and applicable methods. Table 1-3 is a list of monitoring well sampling requirements.

1.6.1 Groundwater Indicator Parameters

Indicator parameters are broad measures of groundwater conditions and should be relatively constant throughout an aquifer. The indicator parameter pH is required to be monitored at the GE-Bridgeville site by the modified HSWA permit.

During each semiannual sampling event, four replicate groundwater samples are collected from the CAEM and supplemental wells indicated on Table 1-3 and analyzed in the field for pH. The purpose of the four replicate analyses at each well is to reduce the likelihood of sampling and laboratory errors affecting the result at each well, which reduces false positive indications of affected groundwater.

1.6.2 Inorganic Parameters

Groundwater samples are analyzed for metals that were either processed in significant quantities at the site or that have been detected on at least one occasion in at least one monitoring well during earlier facility monitoring. The site inorganic parameters are as follows:

- Arsenic
- Barium
- Cadmium
- Chromium
- Lead

One filtered and one unfiltered groundwater sample are collected from each well and analyzed for the five inorganic parameters during each semiannual sampling event.

1.7 Analyses and Data Results

Analytical data obtained during the semiannual sampling events for the five inorganic parameters are statistically evaluated and compared to the greater of either the Safe Drinking

Water Act (SDWA) MCL or background mean for each constituent per Section III.A of the May 1993 modified HSWA Permit (USEPA, 1993). Background means are calculated using pooled data obtained from background wells MW-01R and MW-15R during the eight most recent sampling events. The use of this moving average background data set allows for comparison to the most current background conditions. The greater of either the MCL or the moving average background concentration is then used as the compliance limit for each constituent. If an MCL does not exist for a particular constituent, the compliance limit is defined as the constituent-specific moving average background concentration. The compliance limit for each parameter is statistically compared to the downgradient well data obtained from the eight most recent sampling events. The appropriate statistical method is selected based on the characteristics of the downgradient well data set and the applicable compliance limit. Aquifer impacts are suggested when the downgradient well data exceeds the applicable compliance limit.

For constituents using the MCL as the compliance limit, a tolerance interval having 95 percent coverage and 95 percent confidence was constructed for that constituent from downgradient groundwater data obtained from the eight most recent sampling events.

For constituents using the moving average background concentration as the compliance limit, a confidence interval having a 99 percent confidence level was constructed from downgradient groundwater data obtained from the eight most recent sampling events.

Downgradient monitoring well MW-06R was abandoned on August 27, 1998, due to damage and MW-06RR was installed on August 28, 1999, as a replacement well. Because current statistical analysis methods evaluate data obtained from the eight most recent sampling events, data obtained from MW-06R is included in the data set for MW-06RR.

1.8 Static Water Level Elevation Measurement

Groundwater elevation measurements are collected quarterly to evaluate hydraulic gradient and groundwater flow velocity in the water table aquifer at the GE-Bridgeville site. Water level measurements are collected during the same day for each sampling event to minimize temporal water level elevation differences. Table 1-3 includes a list of facility well locations where water level elevation measurements are collected. Water levels within the groundwater collection sump and Chartiers Creek were also measured.

Table 1-1
Groundwater Monitoring Program

WELL DESIGNATION	PURPOSE
MW-01R	Site Background Wells
MW-15R	
MW-03	Downgradient CAEM Monitoring Wells
MW-04	
MW-06RR	
MW-07	
MW-08AR	
MW-12A	
MW-20	
MW-02	Upgradient Supplemental Monitoring Wells
MW-16	
MW-17	
MW-21	Off-site Supplemental Monitoring Wells
MW-05	Groundwater Elevations Within Fill Materials
MW-08R	
MW-09R	
MW-10	
MW-12	
MW-14R	

Table 1-2
Groundwater Monitoring Parameters and Methods

PARAMETER	METHOD	PRACTICAL QUANTITATION LIMIT (mg/L)
Arsenic (1)	USEPA 7060	0.005
Barium (1)	USEPA 6010	0.02
Cadmium (1)	USEPA 6010	0.005
Chromium (1)	USEPA 6010	0.05
Lead (1)	USEPA 7421	0.005
pH	USEPA 9040	NA

(1) Both filtered and unfiltered groundwater samples are collected for dissolved and total inorganic analysis, respectively.
NA Not applicable

Table 1-3
Groundwater Monitoring Well Sampling Requirements

SAMPLING FREQUENCY	SAMPLING PARAMETERS	MONITORING WELLS	NUMBER OF SAMPLES FOR EACH WELL
Semiannual (March and September)	Arsenic, Barium, Cadmium, Chromium, Lead, and pH	MW-01R, MW-02, MW-03, MW-04, MW-06RR, MW-07, MW-08AR, MW-12A, MW-15R, MW-16, MW-17, MW-20, and MW-21	One filtered and unfiltered sample will be collected for each inorganic parameter.
Quarterly (March, June, September, and December)	Water Level Measurements	MW-05, MW-08R, MW-09R, MW-10, MW-12, and MW-14R	Not applicable

Section 2
Analytical Approach

This section presents the analytical results obtained from analyses of groundwater samples collected during the semiannual sampling events conducted in 2000 at the GE-Bridgeville site to evaluate the effectiveness of corrective actions implemented at the site.

2.1 Sampling and Analysis

Groundwater samples were collected from 13 facility monitoring wells by personnel from Chester on March 27 through March 30, 2000 and September 18 through September 21, 2000, for the two semiannual monitoring events to evaluate groundwater quality.

Groundwater samples were collected according to the modified permit and procedures described in the USEPA-approved QAPP. "Monitoring Well Sampling Reports," which were completed during sampling for each monitoring well during each sampling event, are contained in Appendix B of *March 2000 Groundwater Monitoring Report* (Chester, April 2000) and *September 2000 Groundwater Monitoring Report* (Chester, October 2000). The monitoring well sampling reports contain the following information:

INFORMATION	WELL INFORMATION	PURGE INFORMATION
– Project name	– Water level measurement	– Sample identification
– Project number	– Was well locked or sealed?	– Date purged
– Location	– Was protection in place	– Start time
– Sampling team	– Length of stick up to survey point	– Static water level before purge
– Well number	– Condition of well collar	– One purge volume
– Date collected	– Weather conditions	– Total purge volume
– Time collected	– Comments	– Total purge time
		– pH
		– Specific conductivity
		– Temperature
		– Turbidity (subjective)

During the semiannual monitoring events, both filtered and unfiltered groundwater samples were collected and analyzed for the following five inorganic parameters: arsenic, barium, cadmium, chromium, and lead. Sample analyses were performed by En Chem, which is a USEPA-approved analytical laboratory. Analytical results from the March 2000 semiannual sampling event are summarized in Table 2-1, and analytical results from the September 2000 semiannual sampling event are summarized in Table 2-2. Chain-of-custody documentation is included in the semiannual groundwater monitoring reports included in Appendix A.

2.2 Data Evaluation

Following data validation, the groundwater data were statistically analyzed as discussed in Subsection 1.7 to evaluate the effectiveness of corrective action measures implemented at the site. To date, statistical analyses have been performed on groundwater data obtained from twenty-six sampling events occurring from the first quarter of 1993 to the third quarter of 2000.

The historical data obtained from the three supplemental wells located upgradient of the landfill since corrective action was initiated in the first quarter of 1993 were statistically evaluated to assess trends in constituent concentrations. In addition, historical data from site wells were evaluated using time versus concentration graphs. Constituent concentrations detected in groundwater samples collected from CAEM and supplemental wells during the 2000 reporting period were also directly compared to applicable MCLs.

Results of the data evaluation are discussed in Section 3.

Table 2-1
Summary of Laboratory Analytical Results
March 2000

PARAMETERS[1]	MCLs[2]	LOCATION/SAMPLEDATE					
		BACKGROUND		SUPPLEMENTAL WELLS			
		MW-01R 3/29/00	MW-15R 3/29/00	MW-02 3/29/00	MW-16 3/29/00	MW-17 3/30/00	MW-21 3/29/00
Arsenic	0.05	0.0052	<0.005	<0.005	<0.005	<0.005	<0.005
Arsenic, dissolved	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Barium	2	0.034	0.033	0.062	0.068	0.12	0.11
Barium, dissolved	2	0.033	0.033	0.048	0.057	0.1	0.063
Cadmium	0.005	<0.005	<0.005	<0.005	0.018	<0.005	<0.005
Cadmium, dissolved	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	0.1	<0.05	<0.05	<0.05	<0.005	<0.05	<0.05
Chromium, dissolved	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	0.015[3]	<0.005	<0.005	<0.005	0.026	0.0059	<0.005
Lead, dissolved	0.015[3]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

PARAMETERS[1]	MCLs[2]	LOCATION/SAMPLEDATE						
		CAEM WELLS						
		MW-03 3/29/00	MW-04 3/30/00	MW-06RR 3/30/00	MW-07 3/29/00	MW-08AR 3/30/00	MW-12A 3/30/00	MW-20 3/29/00
Arsenic	0.05	<0.005	<0.005	<0.005	<0.005	0.012 DA	<0.005	0.017
Arsenic, dissolved	0.05	<0.005	<0.005	<0.005	<0.005	0.014 DA	<0.005	<0.005 *
Barium	2	0.083	0.063	0.06	0.11	0.026	0.18	0.13
Barium, dissolved	2	0.077	0.059	0.058	0.1	0.024	0.18	0.1
Cadmium	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium, dissolved	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium, dissolved	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	0.015[3]	<0.005	0.0071	<0.005	0.012	<0.005	0.016	<0.005
Lead, dissolved	0.015[3]	<0.005	<0.005	<0.005	<0.005	<0.005	0.0061 A	<0.005

[1] Analytical results are reported in milligrams per liter (mg/L) unless otherwise noted.

[2] Maximum Contaminant Level (National Primary Drinking Water Standards)

[3] MCL does not exist for lead. The public distribution, at the tap, treatment technology action level for lead is 0.015 mg/L.

A - Analyte detected in method blank.

DA - Dissolved analyte greater than total analyte; analyses passed QC based on precision criteria.

< - Concentration less than the Quantitation Limit.

* - Duplicated analysis not within control limits.

Shading indicates value exceeds applicable MCL.

Table 2-2
Summary of Laboratory Analytical Results
September 2000

PARAMETERS[1]	MCLs[2]	LOCATION/SAMPLE DATE					
		BACKGROUND		SUPPLEMENTAL WELLS			
		MW-01R 09/19/2000	MW-15R 09/19/2000	MW-02 09/19/2000	MW-16 09/20/2000	MW-17 09/21/2000	MW-21 09/20/2000
Arsenic	0.05	0.0071	<0.005	<0.005	<0.005	0.0061	<0.005
Arsenic, dissolved	0.05	0.0069	<0.005	<0.005	<0.005	<0.005	<0.005
Barium	2	0.032	0.033	0.047	0.095	0.12	0.055
Barium, dissolved	2	0.034 DA	0.036 DA	0.046	0.055	0.095	0.04
Cadmium	0.005	<0.005	<0.005	<0.005	<0.005	0.0081	<0.005
Cadmium, dissolved	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chromium	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium, dissolved	0.1	<0.05 A	<0.05 A	<0.05 A	<0.05 A	<0.05 A	<0.05 A
Lead	0.015[3]	<0.005	<0.005	<0.005	0.0082	0.011	0.0054
Lead, dissolved	0.015[3]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

PARAMETERS[1]	MCLs[2]	LOCATION/SAMPLE DATE						
		CAEM WELLS						
		MW-03 09/20/2000	MW-04 09/21/2000	MW-06RR 09/21/2000	MW-07 09/20/2000	MW-08AR 09/21/2000	MW-12A 09/20/2000	MW-20 09/20/2000
Arsenic	0.05	<0.005	<0.005	<0.005	<0.005	0.0062	<0.005	0.0083
Arsenic, dissolved	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Barium	2	0.074	0.087	0.066	0.088	0.054	0.13	0.12
Barium, dissolved	2	0.071	0.069	0.059	0.089 DA	<0.02	0.13	0.11
Cadmium	0.005	<0.005	<0.005	<0.005	<0.005	0.0063	<0.005	<0.005
Cadmium, dissolved	0.005	<0.005	<0.005	<0.005 DA	<0.005	<0.005	<0.005	<0.005
Chromium	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chromium, dissolved	0.1	<0.05 A	<0.05 A	<0.05 A	<0.05 A	<0.05 A	<0.05 A	<0.05 A
Lead	0.015[3]	<0.005	0.032	0.0082	0.014	0.012	0.019	<0.005
Lead, dissolved	0.015[3]	<0.005	<0.005	<0.005	<0.005	<0.005	0.0051	<0.005

[1] Analytical results are reported in milligrams per liter (mg/L) unless otherwise noted.

[2] Maximum Contaminant Level (National Primary Drinking Water Standards)

[3] MCL does not exist for lead. The public distribution, at the tap, treatment teechnology action level for lead is 0.015 mg/L.

A - Analyte detected in method blank.

DA - Dissolved analyte greater than total analyte; analyses passed QC based on precision criteria.

< - Concentration less than the Quantitation Limit.

Shading indicates value exceeds applicable MCL.

Section 3
Analytical Results for 2000

This section discusses the statistical program and summarizes the results of the statistical evaluation of groundwater data obtained during each semiannual sampling event conducted in 2000. Results of the direct comparison of applicable MCLs to constituent concentrations detected in groundwater samples collected from CAEM and supplemental wells during the 2000 semiannual sampling events are also presented. Statistical analyses and direct comparison of constituent concentrations to MCLs were performed by RMT of Greenville, South Carolina.

3.1 Statistical Evaluation

Analytical results for site inorganic parameters of concern were statistically compared to the greater of either applicable MCLs or moving average background concentrations. Background means are established using pooled groundwater data obtained from background wells MW-01R and MW-15R during the eight most recent sampling events. This procedure results in a moving average background concentration for each constituent. Table 3-1 summarizes applicable MCLs and moving average background concentrations for each constituent for the March 2000 and September 2000 semiannual sampling events. Groundwater data obtained from downgradient, as well as background, wells during the eight most recent sampling events were statistically evaluated for basic parameters such as distribution and central tendency. The appropriate statistical method for comparison of downgradient data to applicable compliance limits (*i.e.*, moving average background concentration or MCL) was selected based on the characteristics identified for each data set. If a constituent statistically exceeded the compliance limit, USEPA was notified as specified in the HSWA permit.

If the constituent-specific MCL was greater than the applicable moving average background concentration, the tolerance interval approach was used to compare downgradient concentrations to the compliance limit. Parametric tolerance intervals were constructed to achieve 95 percent coverage and 95 percent confidence using downgradient well data obtained from the eight most recent sampling events. Restricting the data set to the eight most recent observations increases the possibility of a false positive if a nonparametric tolerance limit must be utilized but reduces the possibility that the analysis will be biased by site conditions that no longer exist. This procedure was used to be consistent with previous statistical analyses performed for the site. Nonparametric tolerance intervals require a minimum of nineteen observations to maintain a low false positive rate and high coverage. Where the use of

nonparametric tolerance limits were required, 95 percent coverage and 95 percent confidence could not be achieved, because the percent confidence/percent coverage is a function of sample size. By limiting the sample size to the eight most recent observations, the percent confidence is lowered even though the percent coverage remains at 95 percent. In this instance, nonparametric tolerance intervals are sacrificing a low false positive rate for the use of the eight most recent sampling events. A statistically significant exceedance of the compliance limit is suggested when the upper limit of the tolerance interval exceeds the MCL.

If the constituent-specific moving average background concentration was greater than the applicable MCL, the confidence interval approach was used to compare downgradient concentrations to the compliance limit. The confidence interval was constructed to achieve a 99 percent confidence level using downgradient well data obtained from the eight most recent sampling events. A statistically significant exceedance of the compliance limit is suggested when the entire confidence interval exceeds the moving average background concentration.

3.1.1 Results for March and September 2000 Semiannual Monitoring Events

The applicable MCL was greater than the moving average background concentration for total and dissolved arsenic, barium, cadmium, and chromium for the first and third quarter semiannual sampling events conducted in March and September 2000, respectively. Therefore, the tolerance interval method was required to compare downgradient concentrations of these constituents to the applicable March and September 2000 compliance limit. An MCL is not available for total or dissolved lead. Therefore, the moving average background concentration was used as the compliance limit for total and dissolved lead for the first and third quarter semiannual sampling events conducted in March and September 2000, respectively. As a result, the confidence interval method was required to compare total and dissolved lead concentrations detected in groundwater samples collected from downgradient wells to applicable March and September 2000 compliance limits. Table 3-2 presents the results of the statistical analyses performed for the March and September 2000 semiannual sampling events.

Arsenic

For the 2000 reporting period, the compliance limit for total and dissolved arsenic was defined as the MCL (0.05 parts per million (ppm)). Therefore, exceedance of the compliance limit was evaluated using the Tolerance Interval approach. Statistical evaluation indicated total and dissolved arsenic concentrations detected in groundwater samples collected from downgradient CAEM well MW-06RR during the eight most recent sampling events exceeded

the applicable compliance limit for both semiannual sampling events conducted in 2000. These exceedances are primarily due to detections occurring prior to October 1998. Total arsenic was not detected in groundwater samples collected from downgradient CAEM well MW-06RR during either semiannual sampling event conducted in 2000. Dissolved arsenic has not been detected at this location since April 1998. Exceedances of the total and dissolved arsenic compliance limits were not identified for groundwater samples collected from the remaining downgradient CAEM wells.

Barium

The compliance limit for total and dissolved barium was defined as the MCL (2 ppm). Therefore, exceedance of the compliance limit was evaluated using the Tolerance Interval approach. Statistical evaluation indicated total and dissolved barium concentrations detected in groundwater samples collected from downgradient CAEM wells during the eight most recent sampling events did not exceed the applicable compliance limit for these wells during either semiannual sampling event conducted in 2000.

Cadmium

Prior to first quarter 1998, the compliance limit for cadmium was defined by the background mean, because the background mean was greater than the MCL for this constituent. The background mean for cadmium has decreased over time primarily due to a decrease in detection limit by the analytical laboratory from 0.01 ppm prior to the first quarter of 1998 to 0.005 ppm in subsequent sampling events. Therefore, the compliance limit has shifted from the background mean to the MCL. As a result, cadmium exceedances of the compliance limit are now evaluated using the tolerance interval approach rather than the confidence interval approach. Using the tolerance interval approach to evaluate cadmium concentrations resulted in more cadmium exceedances of the compliance limit in 2000 than were reported prior to 1999, but fewer cadmium exceedances occurred in 2000 than in 1999. These recent cadmium exceedances are likely due to the change in statistical procedure resulting from fluctuating detection limits and not to degradation of groundwater quality. In addition, the reduction in number of cadmium exceedances of the applicable compliance limit in 2000 compared to 1999 is likely related to the lower detection limit. When calculating tolerance intervals, downgradient constituent concentrations reported as not detected are replaced with values representing one-half the detection limit. In addition, data sets are

restricted to the eight most recent sampling events. Data sets used to construct tolerance intervals for downgradient wells in 2000 consisted of a larger proportion of concentrations reported below the lower detection limit of 0.005 ppm than were reported in 1999. Therefore, tolerance intervals calculated in 2000 are less influenced by the higher detection limit than tolerance intervals calculated in 1999.

Statistical evaluation indicated total cadmium concentrations detected in groundwater samples collected from downgradient wells during the eight most recent sampling events exceeded the applicable compliance limit for MW-03, MW-06RR, MW-07, MW-12A, and MW-21 for both semiannual sampling events conducted in 2000. In addition, total cadmium concentrations detected in groundwater samples collected from MW-08AR statistically exceeded the compliance limit for the September 2000 semiannual sampling event. The total cadmium exceedance of the compliance limit identified for groundwater samples collected from downgradient CAEM well MW-08AR is the result of a single detection occurring during the September 2000 sampling event. Total cadmium has not been detected in groundwater samples collected from this downgradient CAEM well since March 1997. Total cadmium exceedances of the compliance limit identified for groundwater samples collected from MW-06RR, MW-12A, and MW-21 for both sampling events and MW-07 for the third quarter sampling event were the result of a single detection occurring in September 1999 or earlier.

Cadmium was detected in groundwater samples collected from five monitoring wells during the eight most recent sampling events used to construct first quarter 2000 tolerance intervals: MW-03 during the June, September, and December 1997 and April 1998 sampling events (0.0123 ppm, 0.026 ppm, 0.022 ppm, and 0.011 ppm cadmium, respectively); MW-06RR during the September 1999 sampling event (0.007 ppm cadmium); MW-07 during the June 1997 and September 1999 sampling events (0.0128 ppm and 0.0077 ppm cadmium, respectively); MW-12A during the September 1999 sampling event (0.0155 ppm cadmium); and MW-21 during the March 1997 sampling event (0.014 ppm cadmium). Cadmium was detected in groundwater samples collected from six monitoring wells during the eight most recent sampling events used to construct third quarter 2000 tolerance intervals: MW-03 during the September and December 1997 and April 1998 sampling events (0.026 ppm, 0.022 ppm, and 0.011 ppm cadmium, respectively); MW-06RR during the September 1999 sampling event (0.007

ppm cadmium); MW-07 during the September 1999 sampling event (0.0077 ppm cadmium); MW-08AR during the September 2000 sampling event (0.0063 ppm cadmium); MW-12A during the September 1999 sampling event (0.0155 ppm cadmium); and MW-21 during the March 1997 sampling event (0.014 ppm cadmium).

Chromium

For the 2000 reporting period, the compliance limit for total and dissolved chromium was defined as the MCL (0.1 ppm). Therefore, exceedance of the compliance limit was evaluated using the Tolerance Interval approach. Statistical evaluation indicated total chromium concentrations detected in groundwater samples collected from downgradient CAEM well MW-06RR during the eight most recent sampling events exceeded the applicable compliance limit for both semiannual sampling events conducted in 2000. These exceedances are due to a single detection occurring in September 1999. Total chromium was not detected in groundwater samples collected from downgradient CAEM well MW-06RR during either semiannual sampling event conducted in 2000. Exceedances of the total and dissolved chromium compliance limits were not identified for groundwater samples collected from the remaining downgradient CAEM wells.

Lead

The compliance limit for total and dissolved lead was defined as the moving average background concentration (0.004 ppm and 0.003 ppm, respectively) for the 2000 reporting period. Therefore, exceedance of the compliance limit was evaluated using the Confidence Interval approach. Statistical evaluation indicated dissolved lead concentrations detected in groundwater samples collected from downgradient CAEM wells during the eight most recent sampling events did not exceed the applicable compliance limit for both semiannual sampling events conducted in 2000. Dissolved lead exceedances previously identified in downgradient CAEM wells MW-03, MW-08AR, MW-12A, and possibly MW-07 during 1999 appear to be the result of fluctuating laboratory detection limits. In 2000, data obtained from the eight most recent sampling events used to construct confidence intervals for downgradient CAEM wells were based on a single detection limit of 0.005 ppm.

Dissolved lead was detected in groundwater samples collected from three downgradient CAEM wells during the eight most recent sampling events used to construct first quarter 2000 confidence intervals: MW-06RR during the June and September/October 1997 and April 1998 sampling events (0.0078 ppm, 0.00666 ppm, and 0.0167 ppm dissolved lead, respectively); MW-07 during the September 1997 sampling event (0.0246 ppm dissolved lead); and MW-12A during the March 2000 sampling event (0.0061 ppm dissolved lead). Dissolved lead was detected in groundwater samples collected from three downgradient CAEM wells during the eight most recent sampling events used to construct third quarter 2000 confidence intervals: MW-06RR during the September/ October 1997 and April 1998 sampling events (0.00666 ppm and 0.0167 ppm dissolved lead, respectively); MW-07 during the September 1997 sampling event (0.0246 ppm dissolved lead); and MW-12A during the March and September 2000 sampling events (0.0061 ppm and 0.0051 ppm dissolved lead, respectively).

Statistical evaluation indicated total lead concentrations detected in groundwater samples collected from downgradient CAEM wells MW-04, MW-06RR, MW-07, and MW-12A during the eight most recent sampling events exceeded the applicable compliance limit for both semiannual sampling events conducted in 2000. Total lead was detected in seven of the eight groundwater samples collected from MW-06RR and MW-07 and the eight groundwater samples collected from MW-04 and MW-12A used to construct first and third quarter 2000 confidence intervals.

3.1.2 Summary for 2000 Reporting Period

Statistical exceedances of the compliance limit for the 2000 reporting period were identified for total metals concentrations in six of the seven downgradient CAEM wells and supplemental monitoring well MW-21 located off site across Chartiers Creek. Compared to third quarter 1999 results, two new statistical exceedances of the compliance limit were identified for the March 2000 sampling event: total lead in groundwater samples collected from downgradient CAEM wells MW-04 and MW-12A.

Compared to the March 2000 data, one new statistical exceedance of the compliance limit was identified for the September 2000 sampling event: total cadmium in groundwater samples collected from downgradient CAEM well MW-08AR. Exceedance of the total cadmium compliance limit identified for groundwater samples collected from downgradient CAEM well MW-08AR is the result of a single detection occurring during the September 2000 sampling event. Total cadmium has not been

detected in this well since March 1997. Therefore, first quarter 2001 data will be used to confirm these detections.

The greatest number of statistical exceedances of the compliance limit during the 2000 reporting period were associated with groundwater samples collected from downgradient CAEM wells MW-06RR, MW-07, and MW-12A. The compliance limit was statistically exceeded by only one dissolved metal during the 2000 reporting period: dissolved arsenic in MW-06RR. Some of the calculated statistical exceedances of the compliance limit are based on fluctuating detection limits, laboratory changes, or data collected more than two years ago. Eliminating these artificial exceedances results in the following statistically significant exceedances:

- total and dissolved arsenic in MW-06RR (March and September 2000)
- total cadmium in MW-03 (March and September 2000), MW-06RR (March and September 2000), MW-07 (March and September 2000), MW-08AR (September 2000), and MW-12A (March and September 2000)
- total chromium in MW-06RR (March and September 2000)
- total lead in MW-04, MW-06RR, MW-07, and MW-12A (March and September 2000)

Total barium and chromium concentrations detected in groundwater samples collected from downgradient CAEM wells MW-04 and MW-08AR, total cadmium concentrations detected in groundwater samples collected from downgradient CAEM wells MW-04, MW-08AR, and MW-20, dissolved cadmium concentrations detected in groundwater samples collected from off-site supplemental well MW-21, and dissolved lead concentrations detected in groundwater samples collected from downgradient CAEM wells MW-03, MW-04, MW-07, MW-08AR, and MW-12A did not statistically exceed the applicable compliance limit during the March 2000 sampling event as they did during the third quarter 1999 sampling event.

Detected metals concentrations may be due, in part, to the presence of suspended solids in the groundwater samples. A review of field notes recorded for the semiannual sampling events indicates that a majority of the groundwater samples collected were slightly to highly turbid. Precautions are being taken to minimize the collection of turbid samples. However, due to the sampling technique, the collection of turbid samples is difficult to avoid.

3.2 Trend Analysis

Historical groundwater data obtained from groundwater samples collected from supplemental monitoring wells MW-02, MW-16, and MW-17 located upgradient of the landfill were

evaluated for statistically significant trends in constituent concentrations using the Sen's Slope/Mann-Kendall tests for temporal trends. These tests are used to evaluate the significance of an apparent trend in constituent concentrations and to estimate the magnitude of that trend or whether the trend is statistically different from no trend. In addition, historical groundwater data obtained from site wells are graphically presented in Figure 3-1 through Figure 3-15. Results obtained for multiple samples collected during a single sampling event were averaged for graphing purposes. Results reported as not detected were replaced with values representing one-half the detection limit prior to graphing the data.

Statistically significant increasing trends in constituent concentrations for the March and September 2000 semiannual sampling events were identified for the following constituent/supplemental well pairs: total chromium in MW-02 and dissolved chromium and lead in MW-02, MW-16, and, MW-17. Closer inspection of analytical results indicates these trends may be due to fluctuating detection limits and not to increasing constituent concentrations. With the exception of two chromium detections in supplemental well MW-02, these constituents were not detected in supplemental wells. Therefore, no valid statistical trends in constituent concentrations can be identified for these wells.

A review of the graphs of the historical data indicates constituent concentrations in downgradient wells have generally decreased to below current applicable compliance limits, with the exception of total lead concentrations in a few wells during the first quarter 2000 sampling event and total cadmium and total and dissolved lead concentrations in a few wells during the third quarter 2000 sampling event. Total cadmium and lead concentrations also exceeded the compliance limit in supplemental wells located upgradient of the landfill during the first and third quarter 2000 sampling events.

3.3 Maximum Contaminant Level Comparison

Concentrations of two inorganic constituents, cadmium and lead, were detected above their respective MCLs in groundwater samples collected from the GE-Bridgeville site during the 2000 reporting period. A comparison of analytical results obtained during the March and September 2000 sampling events to applicable MCLs is summarized in Table 2-1 and Table 2-2, respectively. Constituent concentrations detected above applicable MCLs are discussed below.

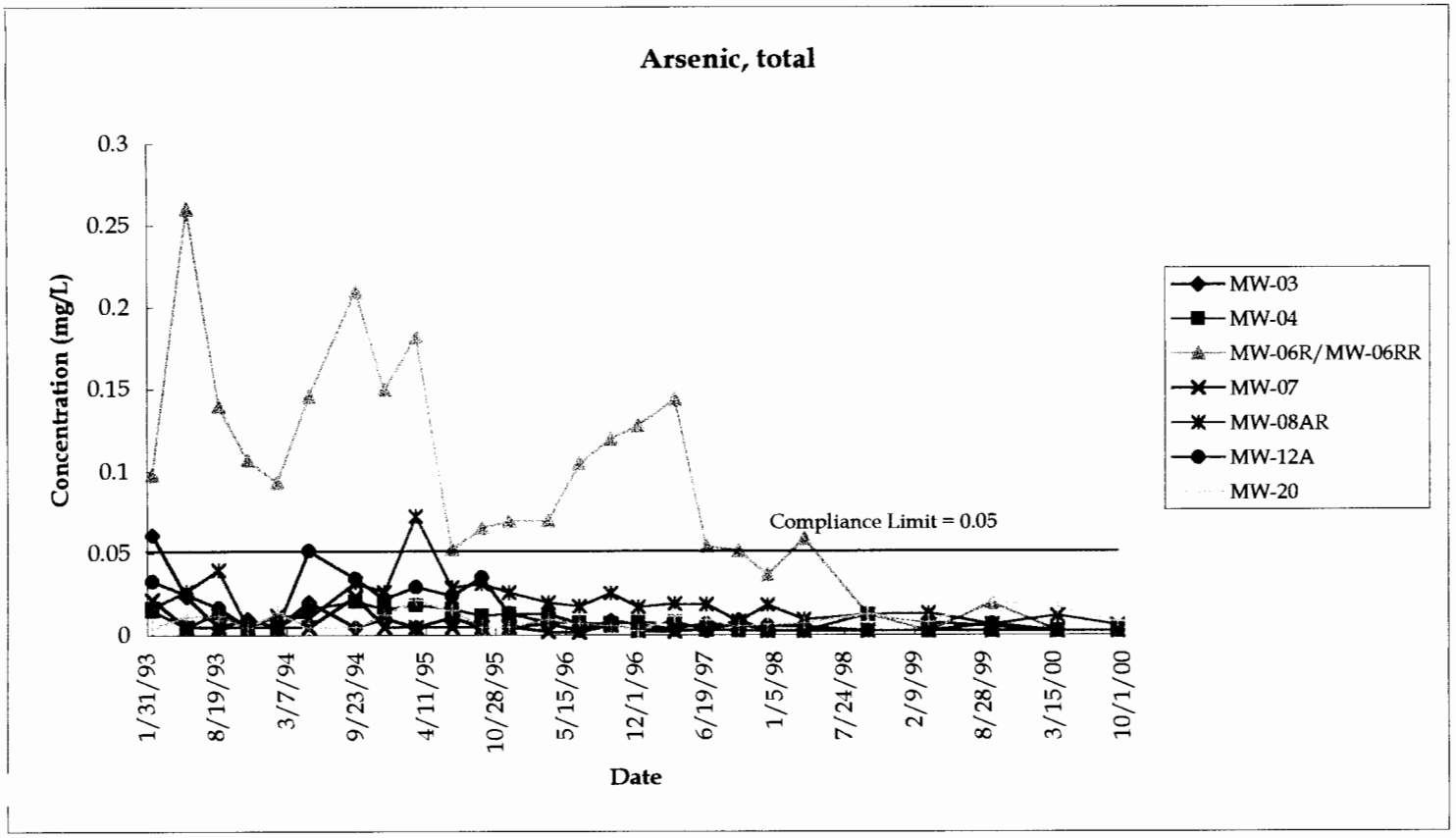
Total cadmium was detected at a concentration exceeding the MCL of 0.005 ppm in the groundwater sample collected from supplemental monitoring well MW-16 (0.018 ppm) located upgradient from the landfill during the first quarter 2000 semiannual sampling event, but cadmium was not detected in groundwater samples collected from remaining site monitoring wells. Total cadmium was detected at concentrations slightly above the MCL in groundwater samples collected from supplemental monitoring well MW-17 (0.0081 ppm) located upgradient

from the landfill and downgradient CAEM well MW-08AR (0.0063 ppm) during the third quarter 2000 semiannual sampling event. Dissolved cadmium was not detected in groundwater samples collected from these wells. Cadmium was not detected in groundwater samples collected from the remaining site monitoring wells during the third quarter semiannual sampling event. In addition, total cadmium has been routinely detected above the MCL in groundwater samples collected from upgradient supplemental well MW-17. These results suggest the presence of cadmium in site groundwater may be due to off-site influences or cadmium is naturally occurring.

An MCL does not currently exist for lead. However, the public distribution, at the tap, treatment technology action level for lead is 0.015 ppm. Total lead was detected at a concentration above the action level in groundwater samples collected from downgradient CAEM well MW-12A (0.016 ppm) and supplemental well MW-16 (0.026 ppm) located upgradient of the landfill during the first quarter 2000 semiannual sampling event. With the exception of MW-12A, dissolved lead was not detected in groundwater samples collected from these wells during the first quarter 2000 semiannual sampling event. During the third quarter semiannual sampling event, total lead was detected above the applicable action level in groundwater samples collected from downgradient CAEM wells MW-04 (0.032 ppm) and MW-12A (0.019 ppm). With the exception of MW-12A, dissolved lead was not detected in groundwater samples collected from these wells during the third quarter 2000 sampling event. These results suggest total lead concentrations may be associated with solids present in the sample and, therefore, are not representative of groundwater quality.

The results of the MCL comparisons indicate that individual constituent concentrations detected in groundwater samples collected during the 2000 reporting period are generally below applicable MCLs. The total cadmium concentration detected in the groundwater sample collected from downgradient CAEM well MW-08AR during the September 2000 sampling event was similar to the cadmium concentration detected in the groundwater sample collected from supplemental well MW-17. Exceedance of the action level for lead was limited to total lead in two downgradient CAEM wells and one upgradient supplemental well during the 2000 reporting period. With the exception of MW-12A, dissolved lead was not detected in groundwater samples collected from these wells. Therefore, total lead detections are likely associated with solids present in the groundwater sample and are not representative of groundwater quality.

Figure 3-1
Time vs. Concentration Graphs
Downgradient Wells



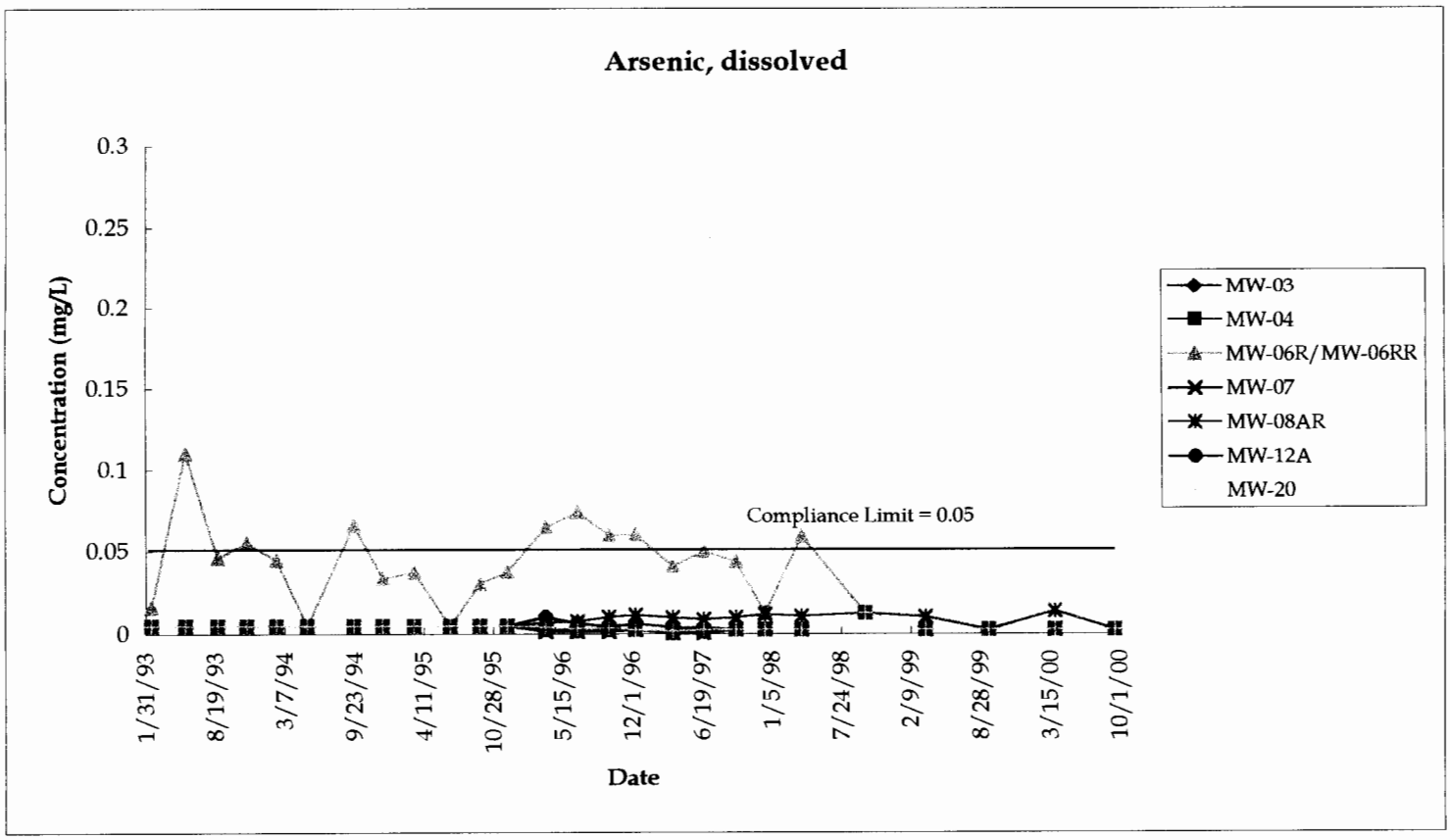
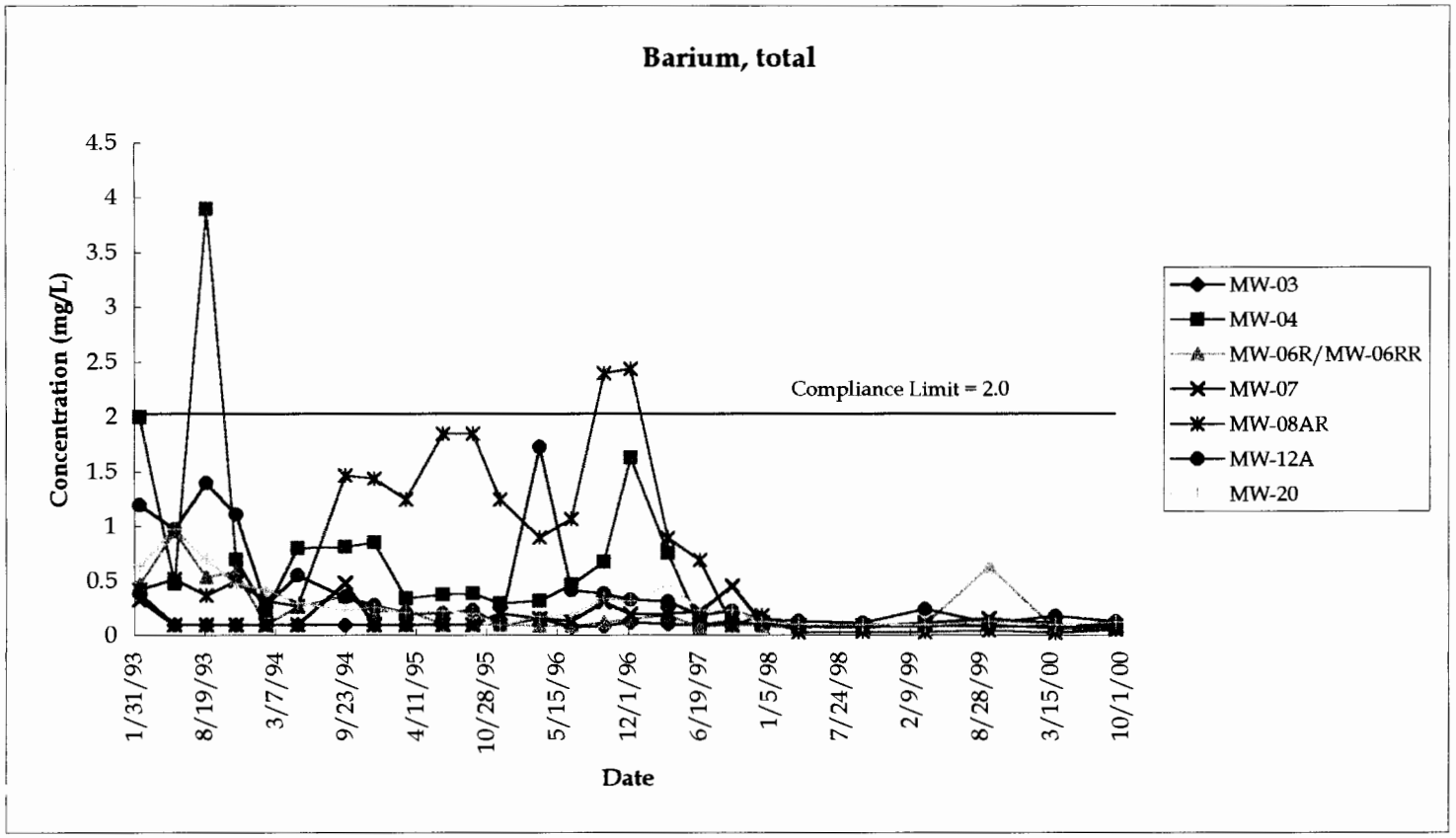


Figure 3-2
Time vs. Concentration Graphs
Downgradient Wells



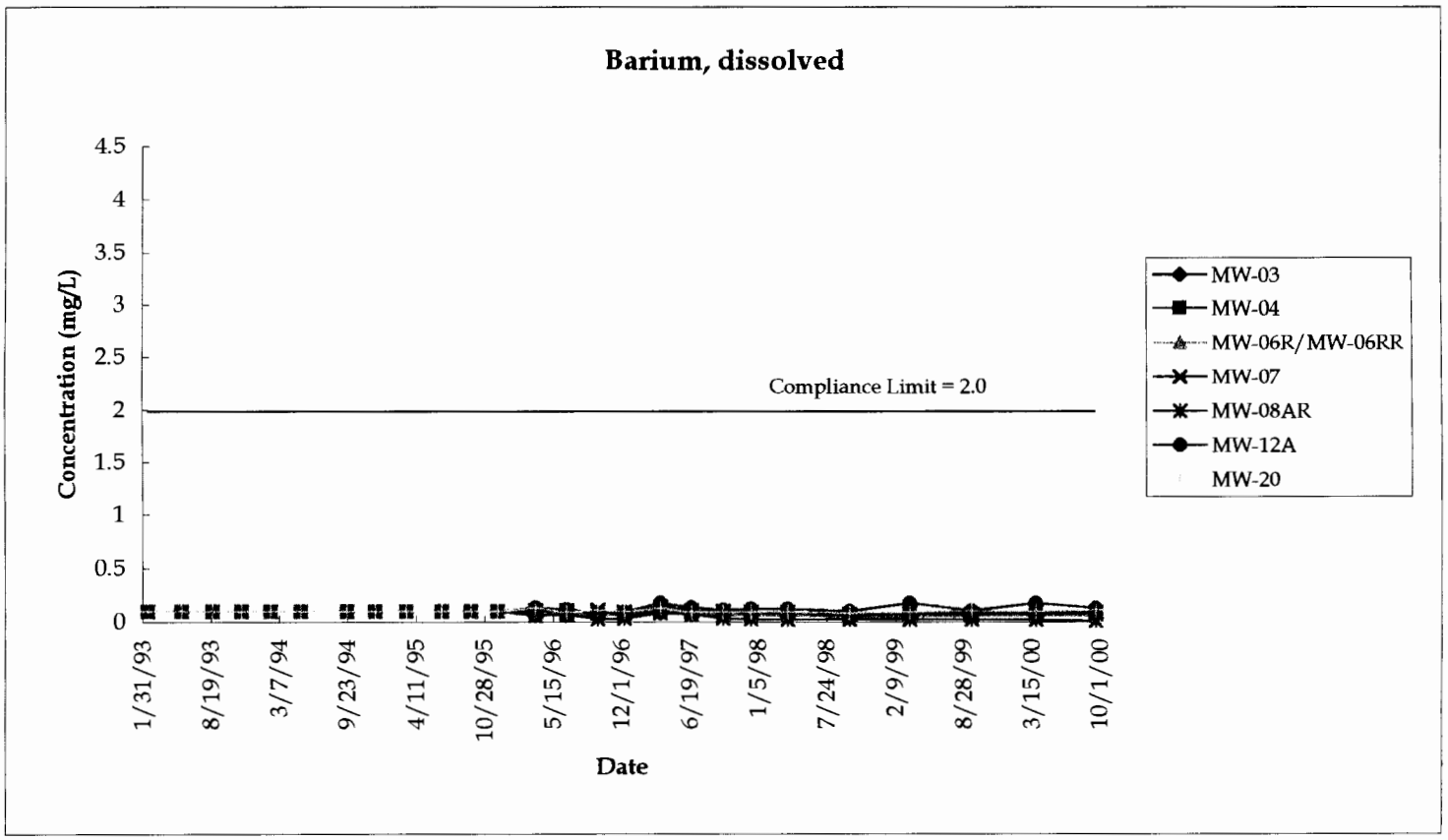
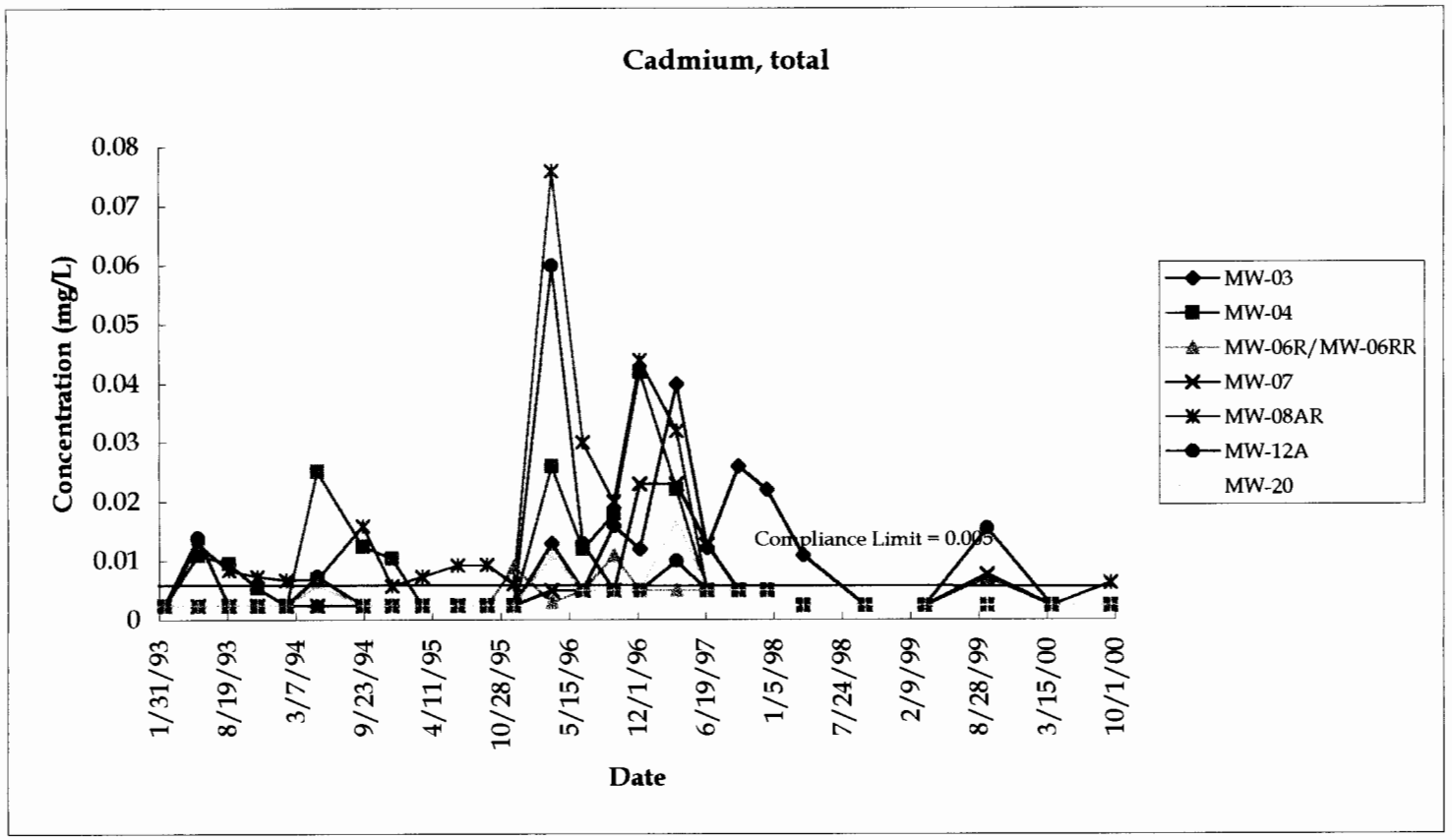


Figure 3-3
Time vs. Concentration Graphs
Downgradient Wells



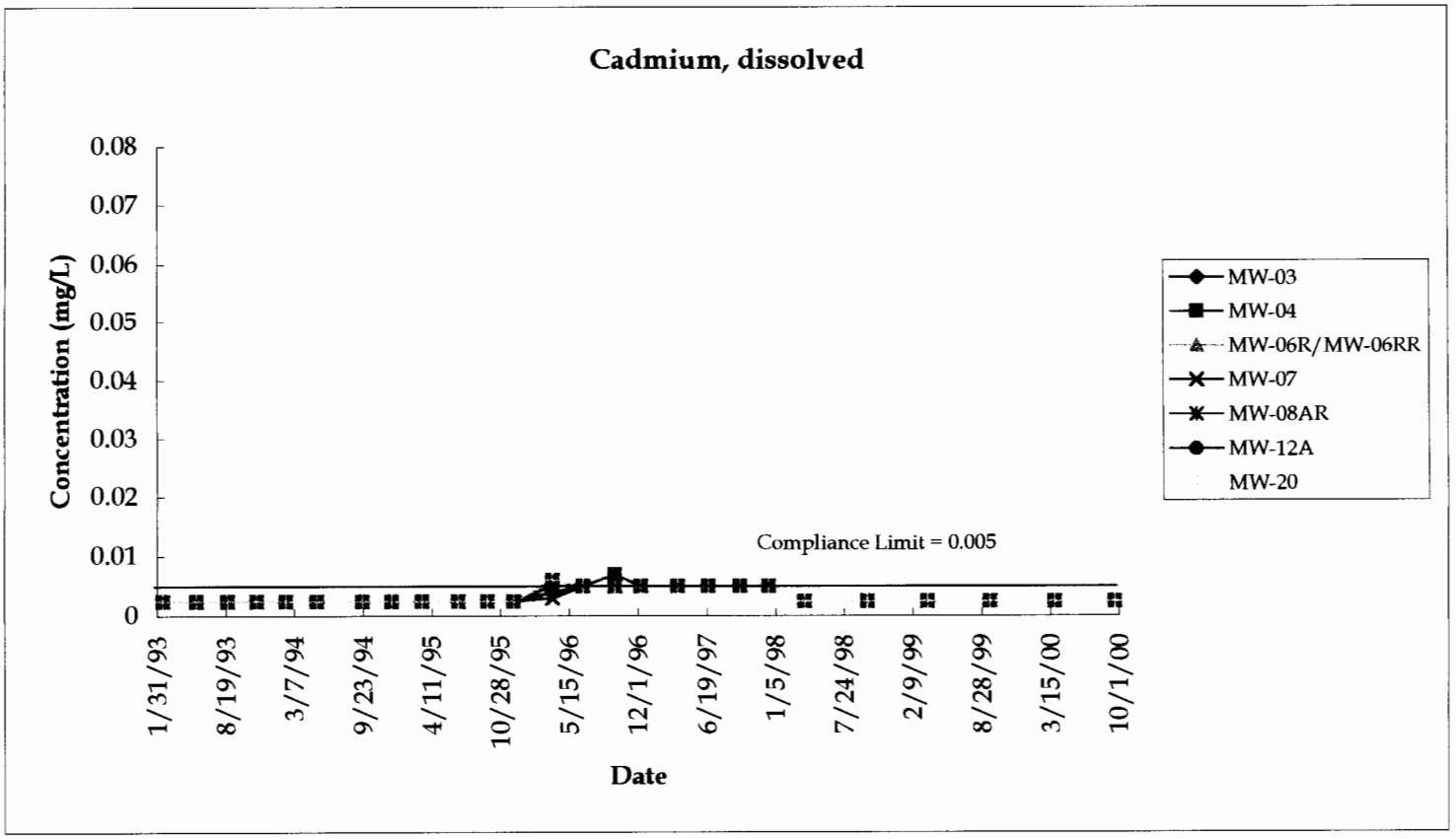
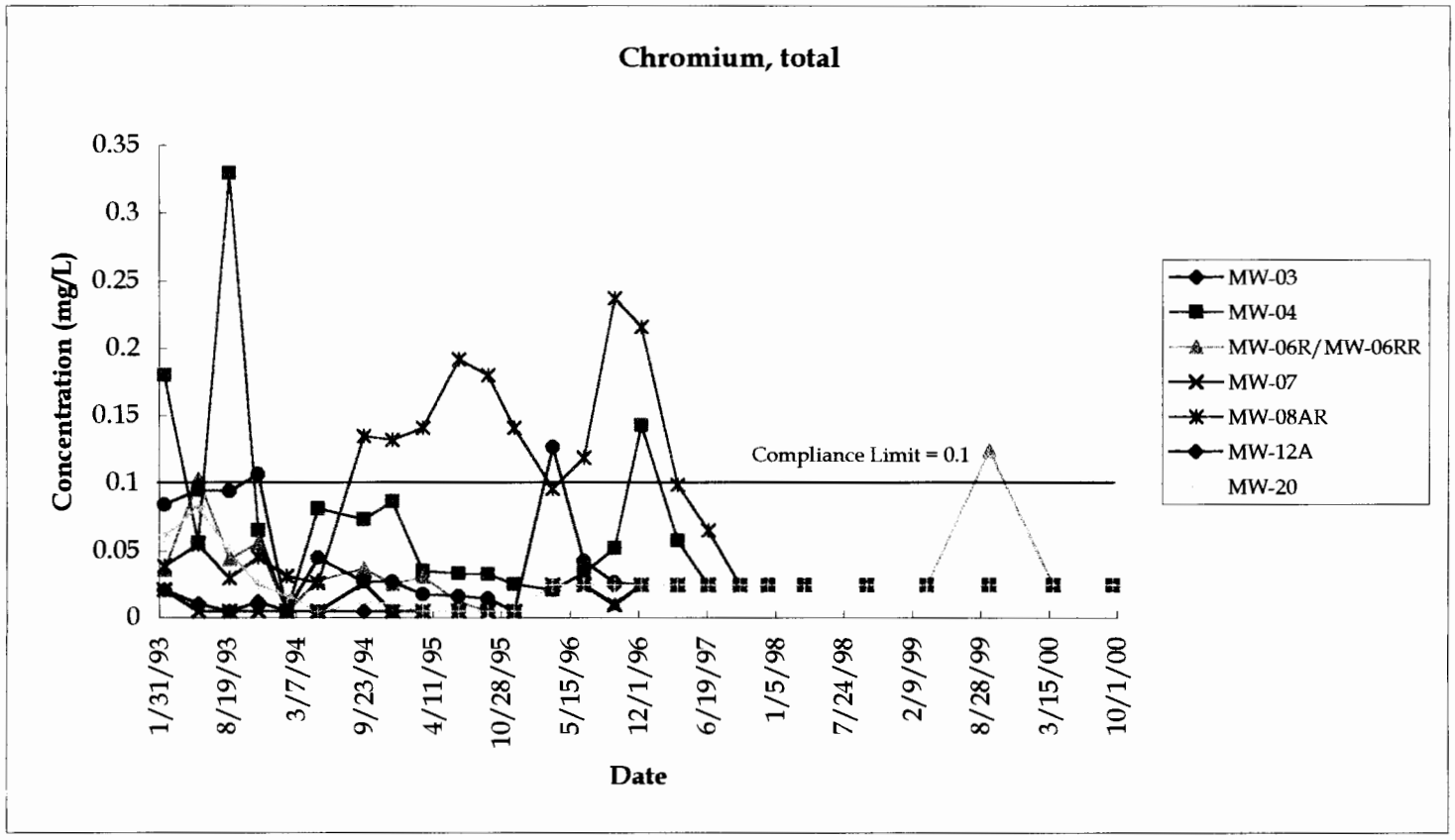


Figure 3-4
Time vs. Concentration Graphs
Downgradient Wells



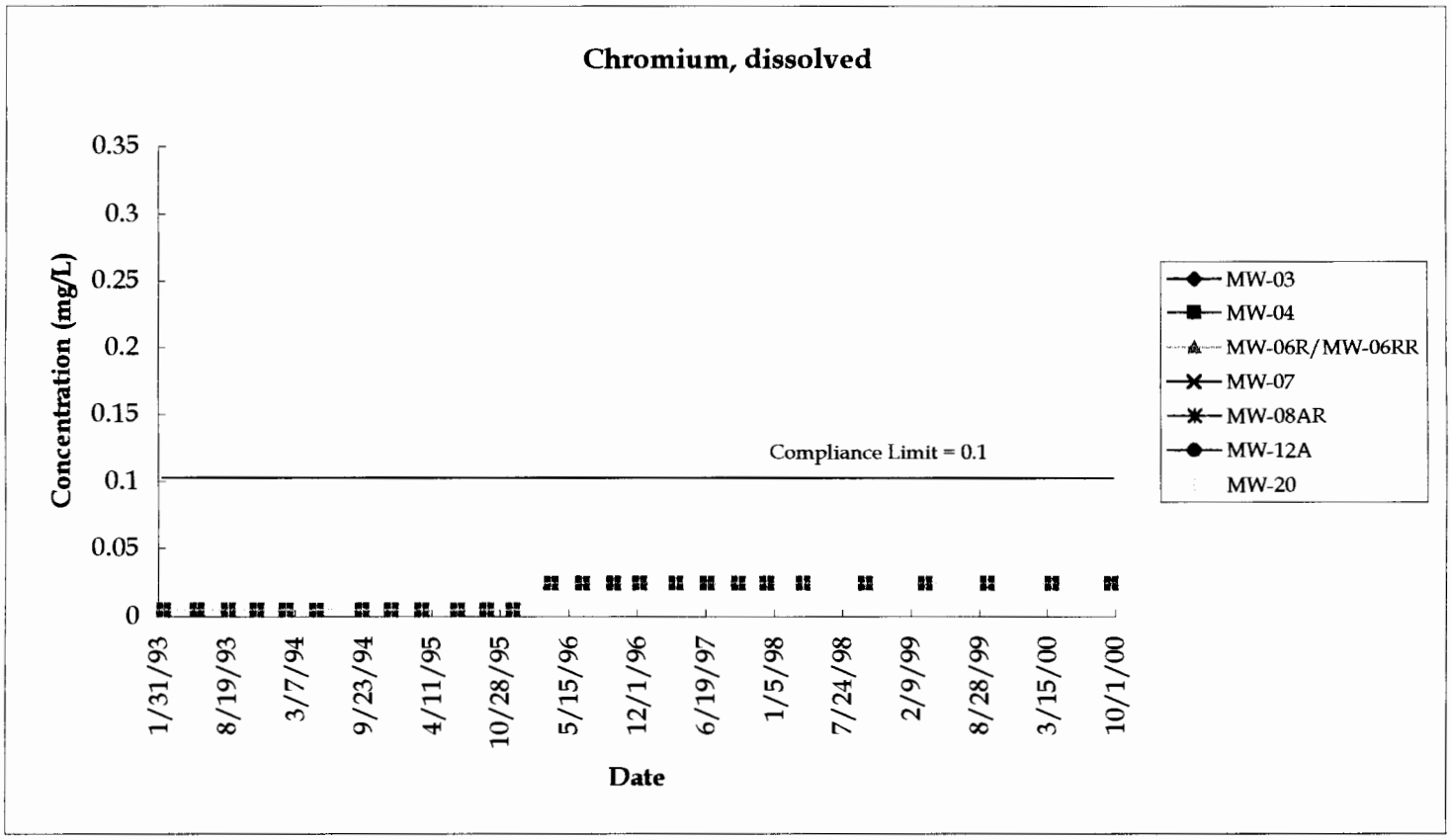
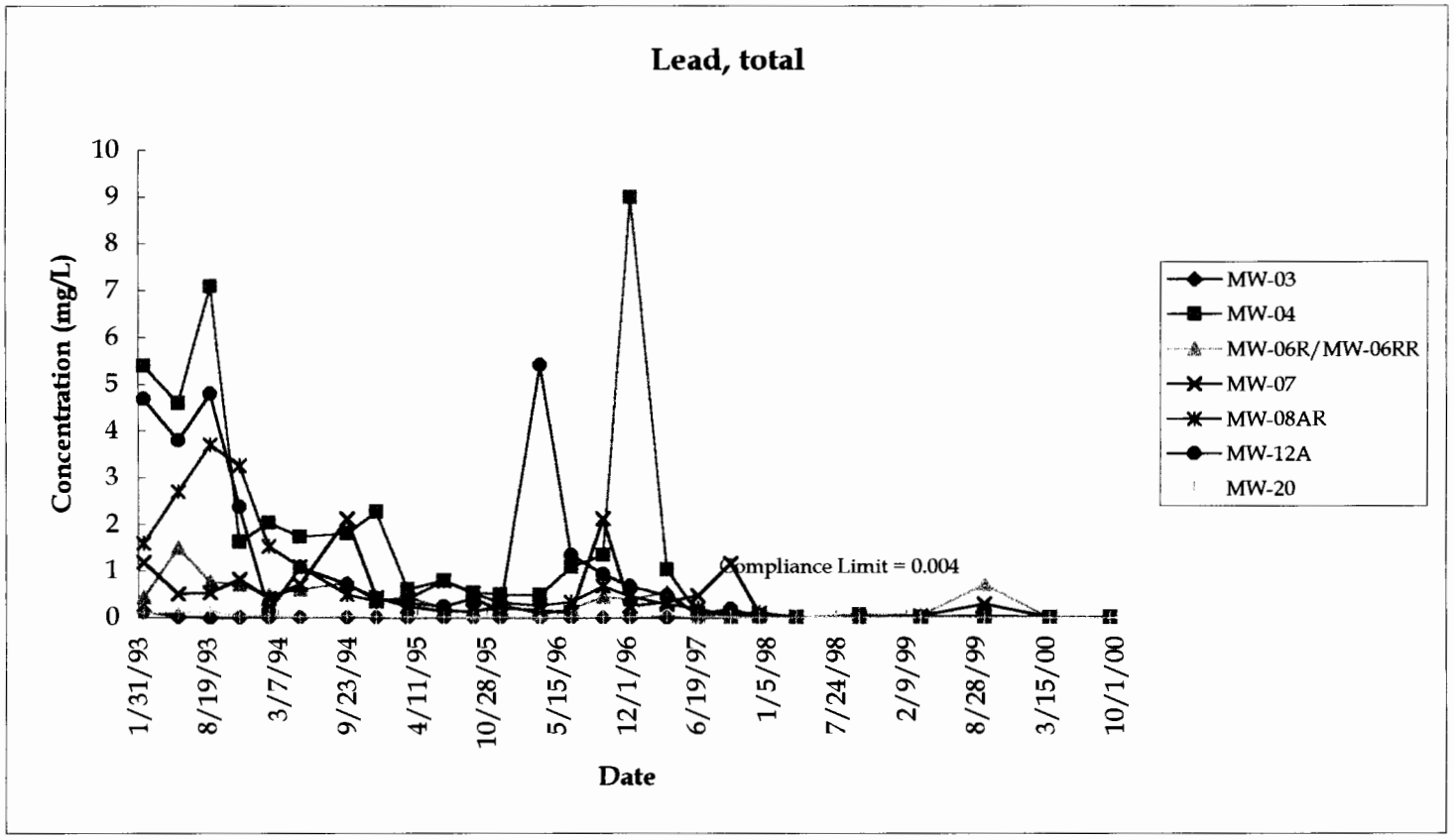


Figure 3-5
Time vs. Concentration Graphs
Downgradient Wells



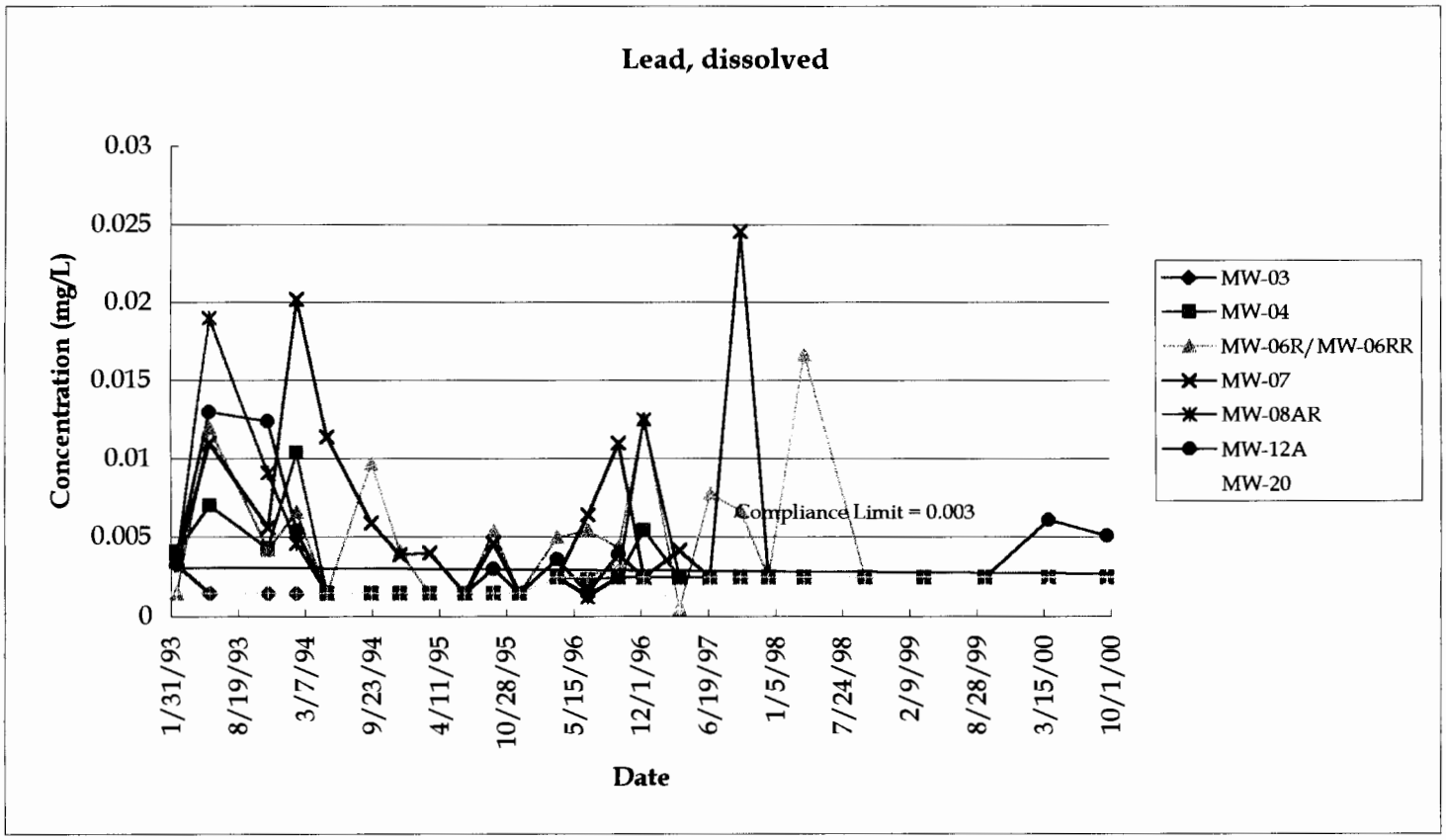
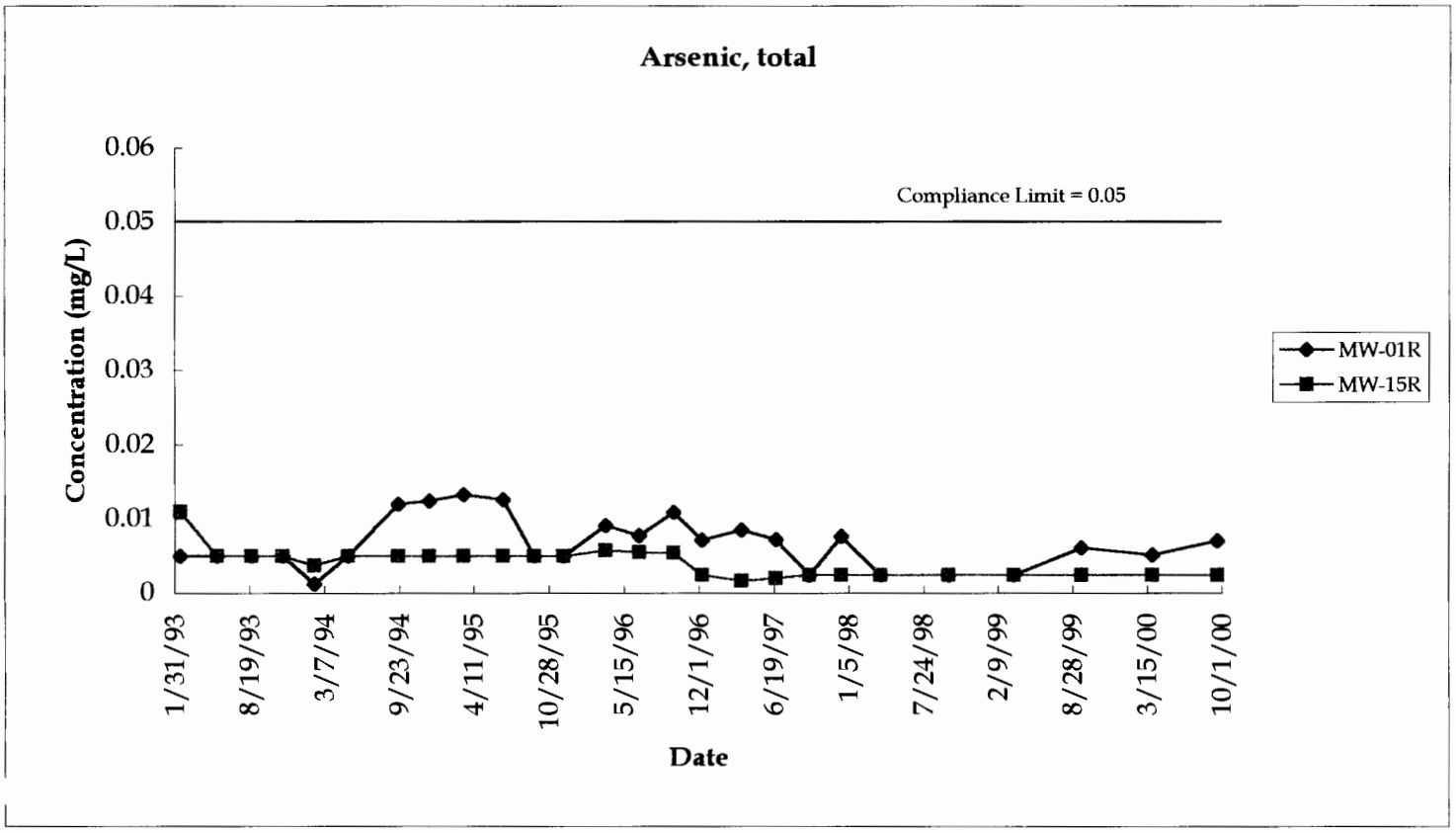


Figure 3-6
Time vs. Concentration Graph
Background Wells



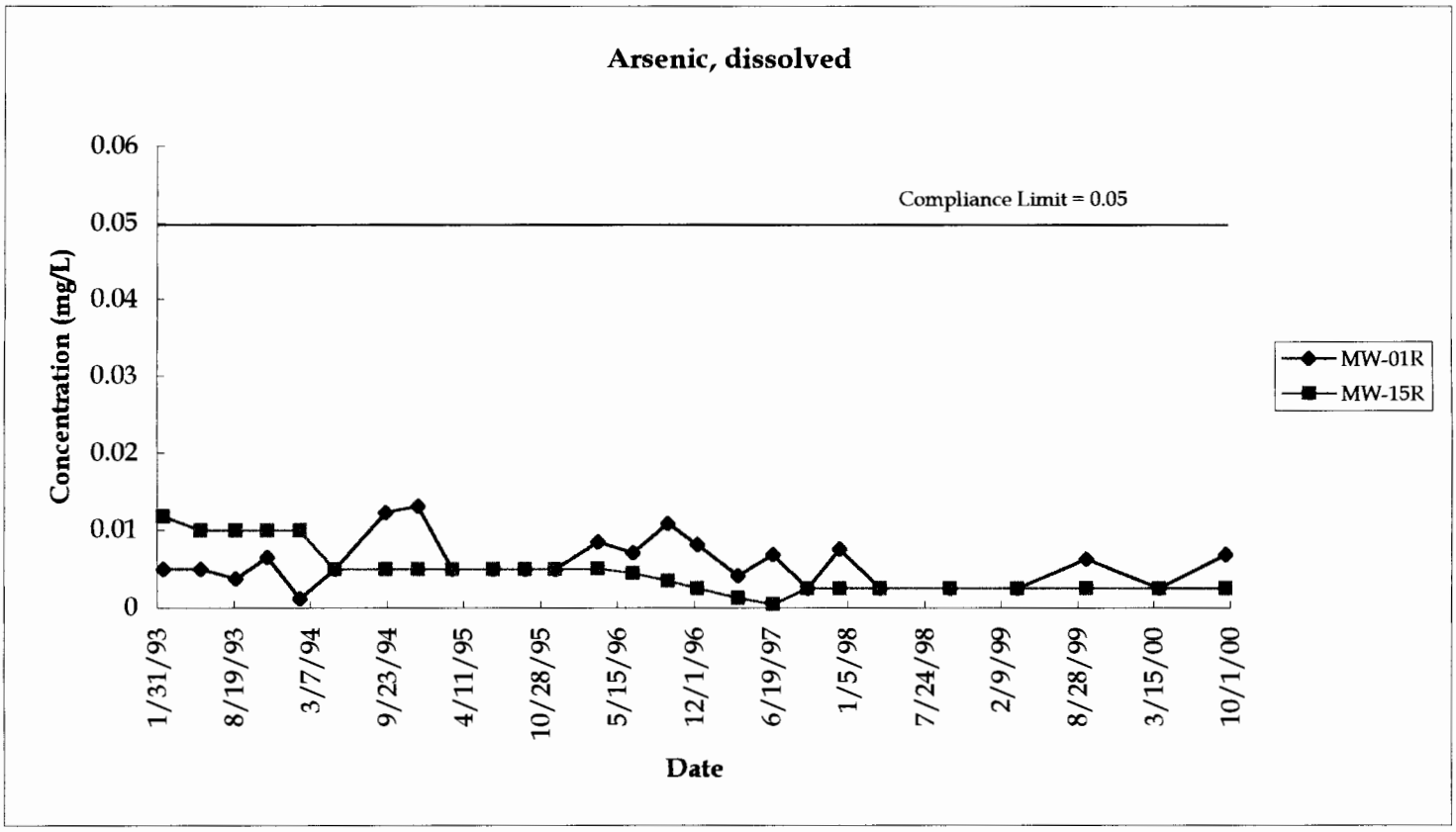
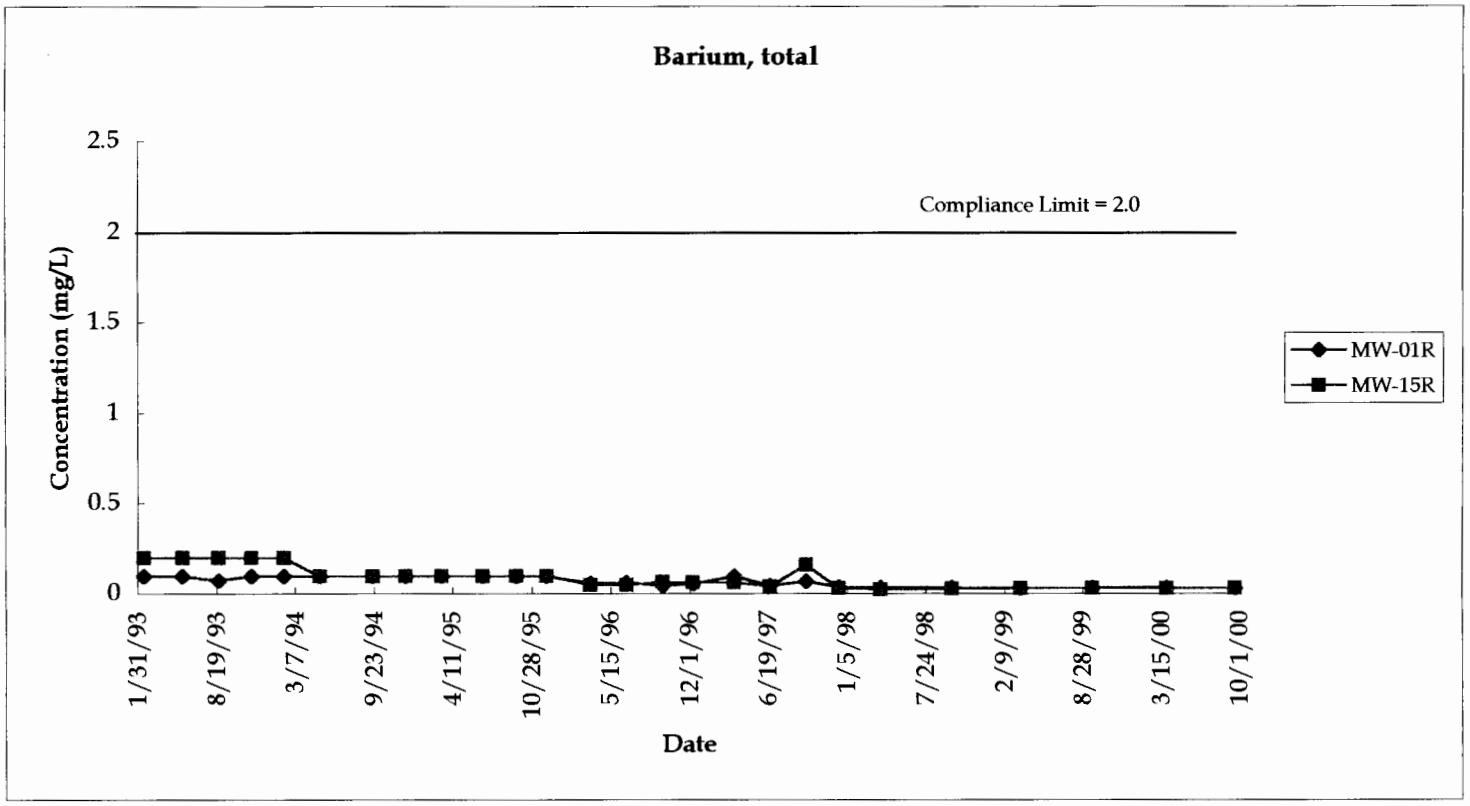


Figure 3-7
Time vs. Concentration Graph
Background Wells



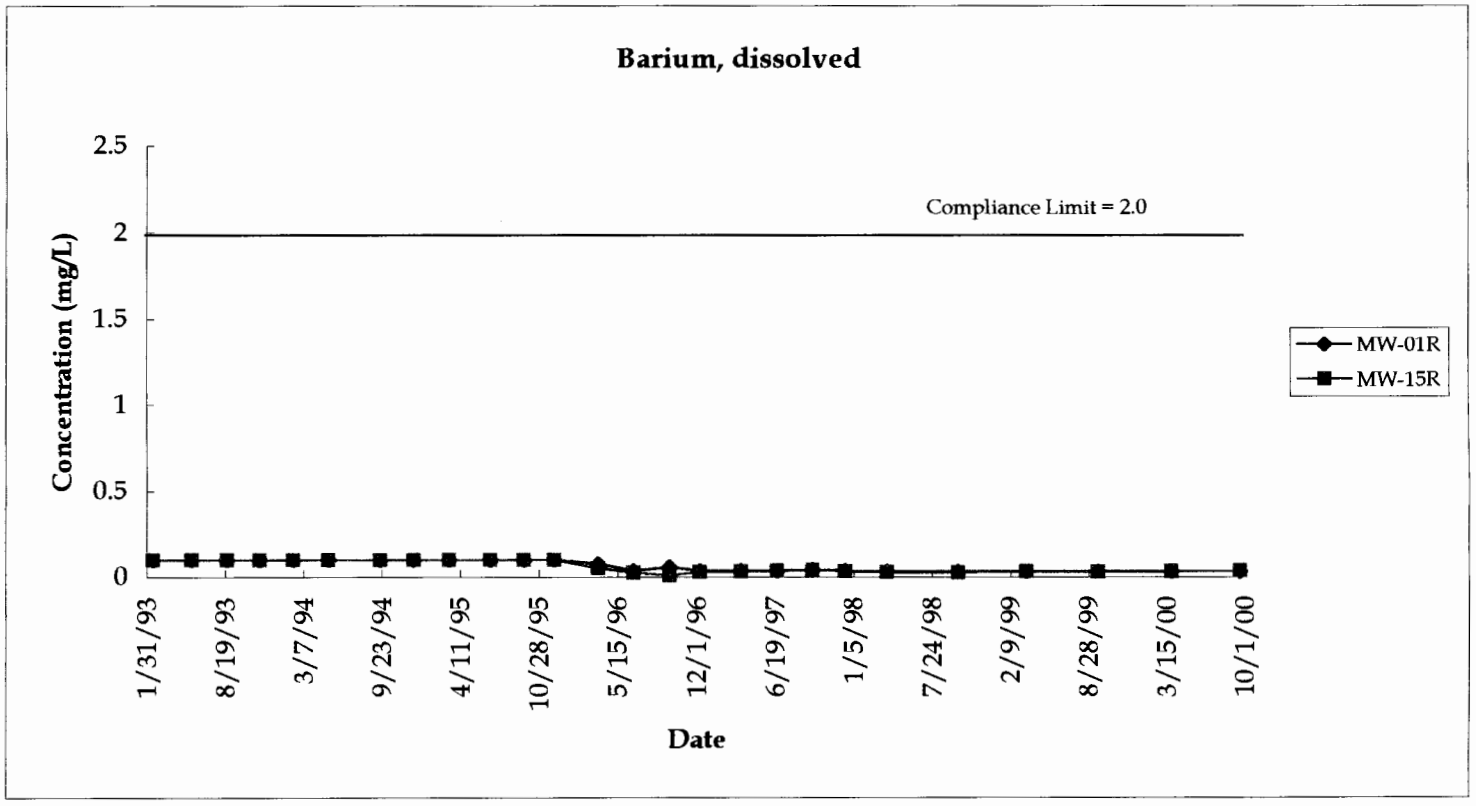
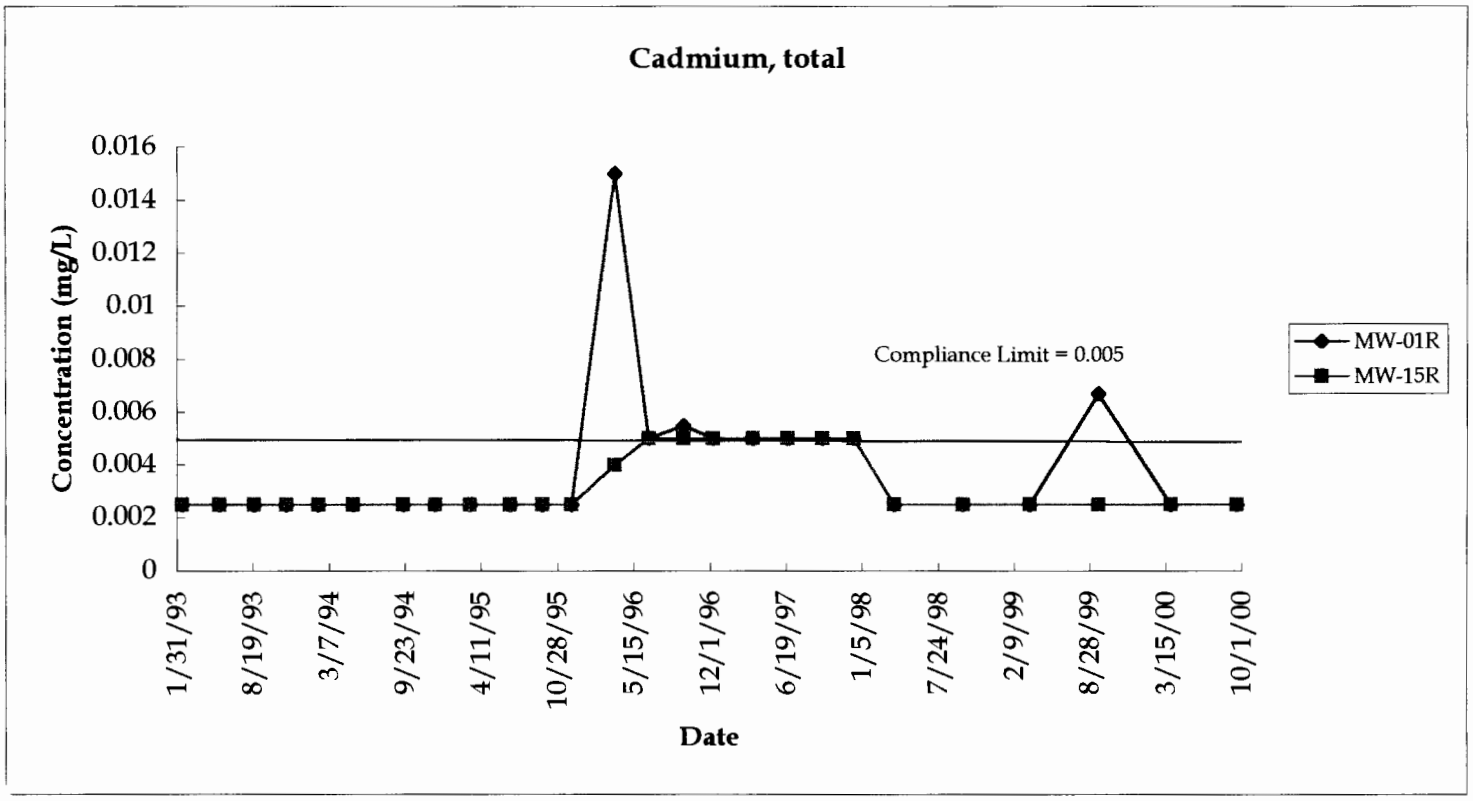


Figure 3-8
Time vs. Concentration Graph
Background Wells



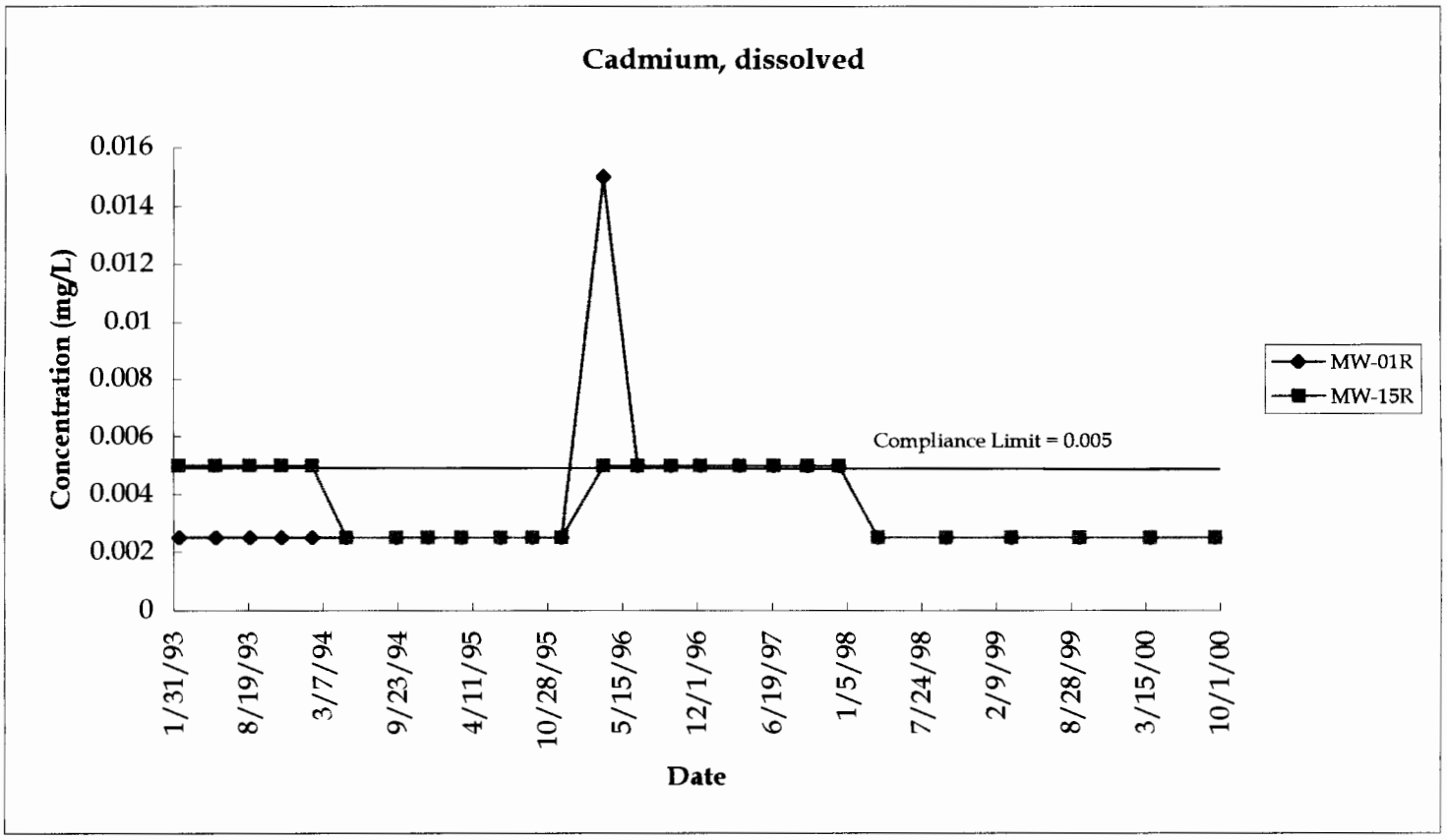
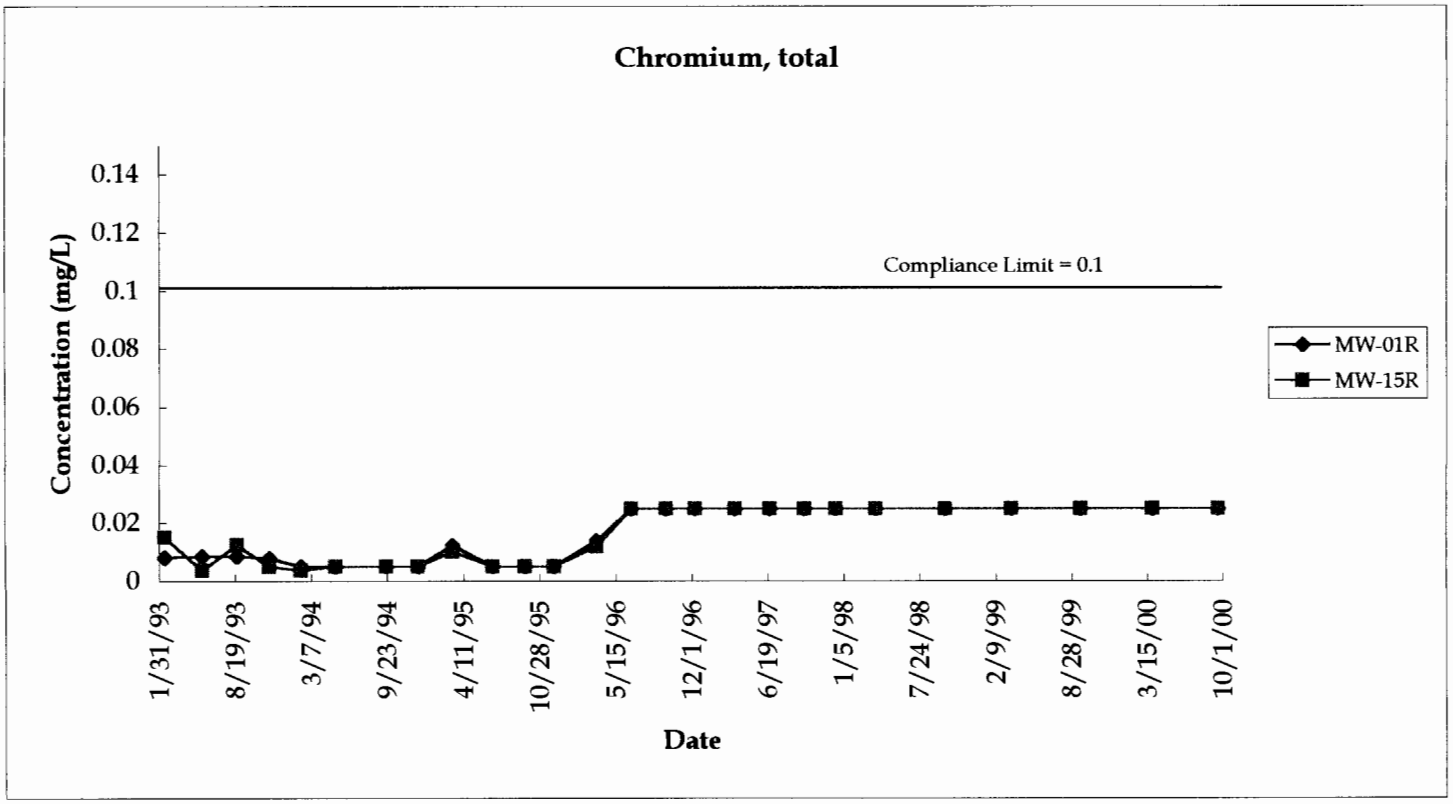


Figure 3-9
Time vs. Concentration Graph
Background Wells



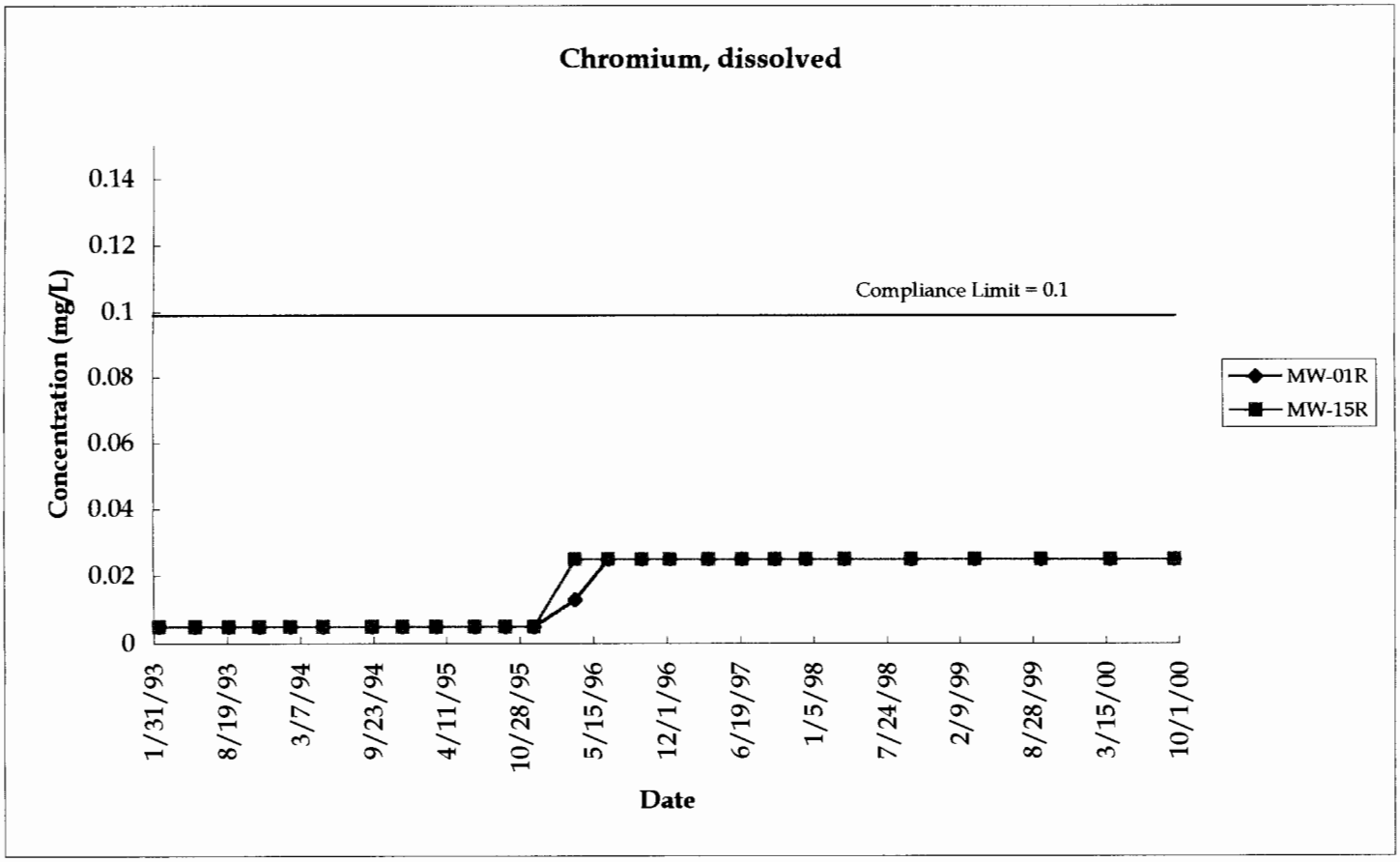
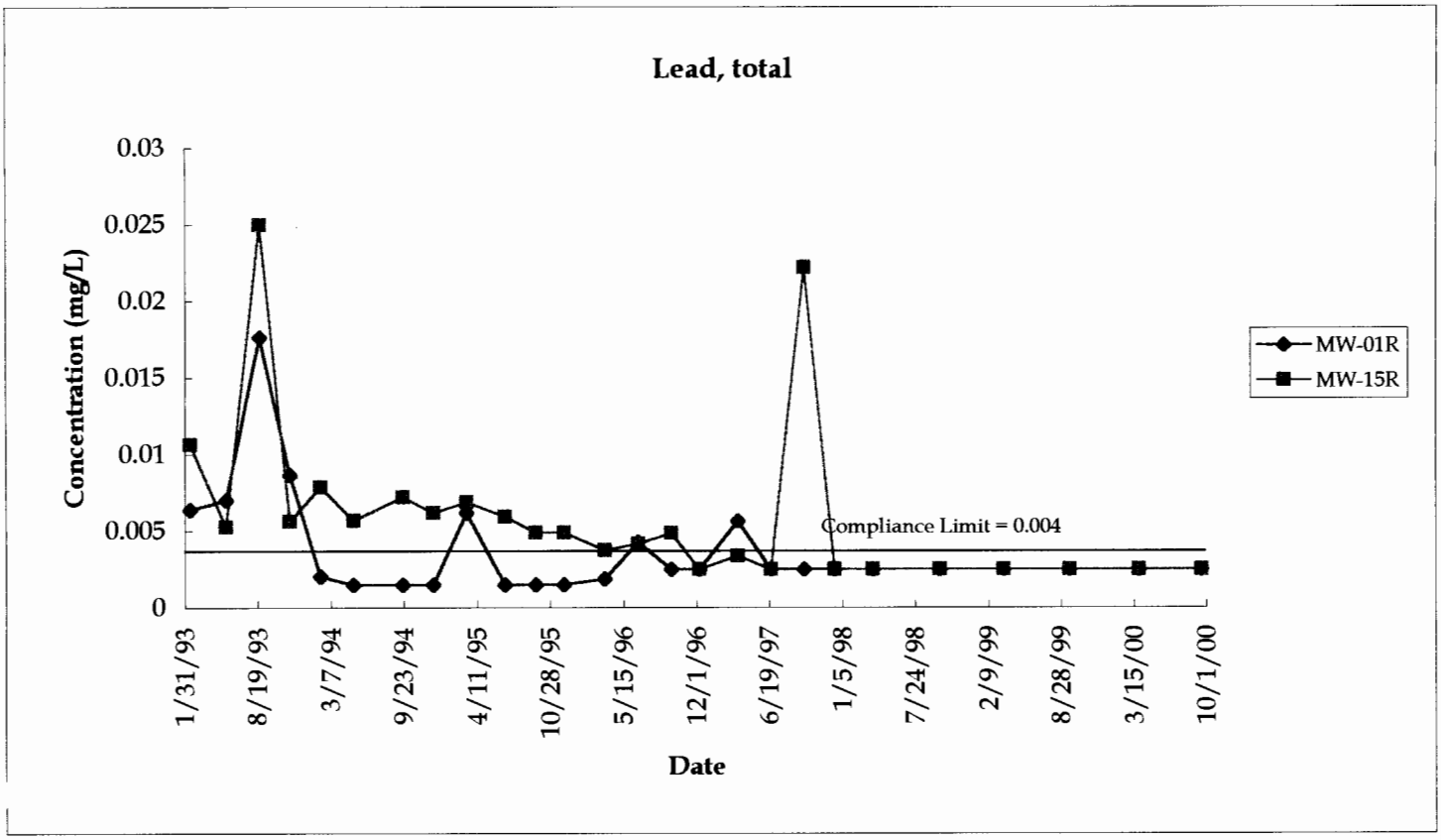


Figure 3-10
Time vs. Concentration Graph
Background Wells



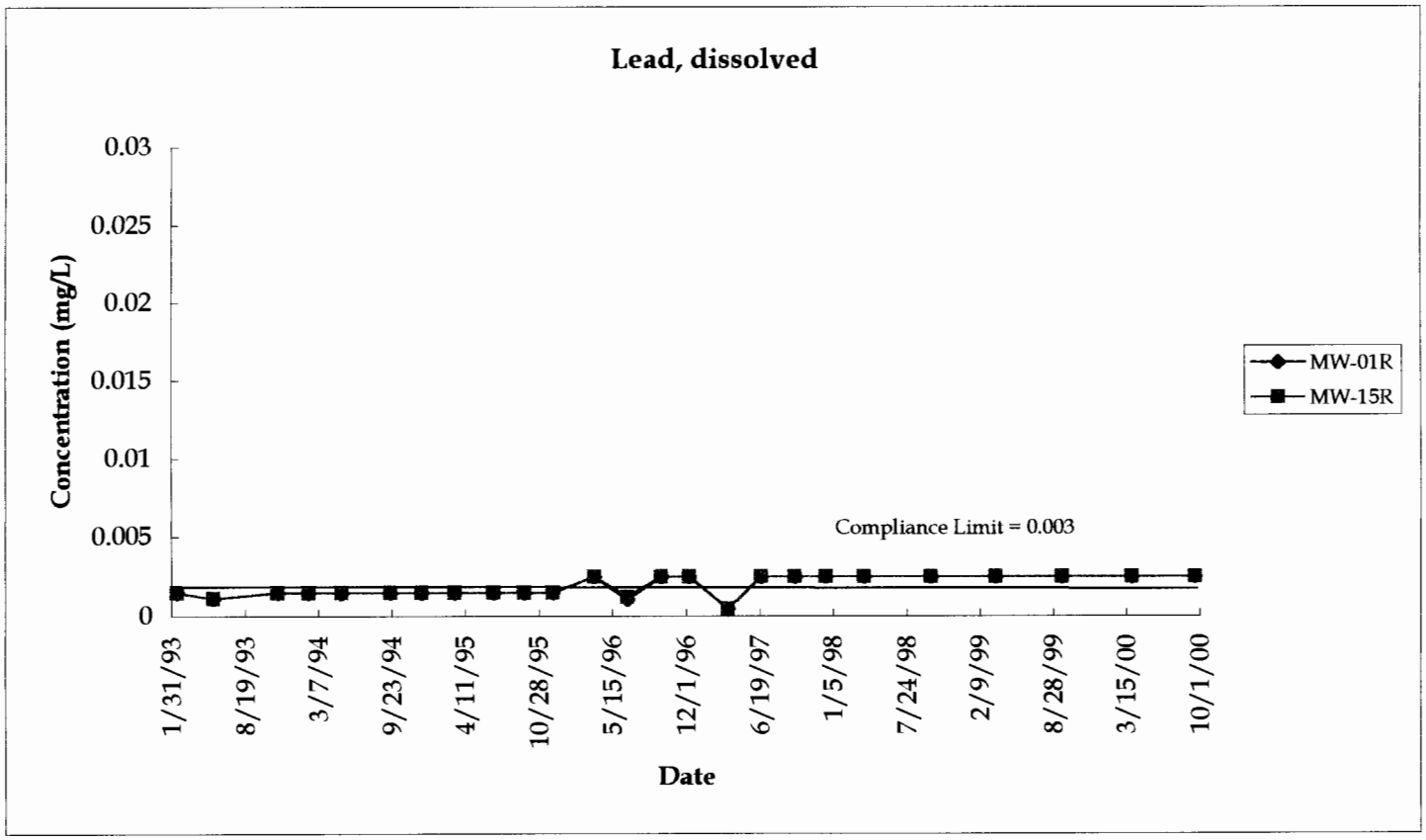
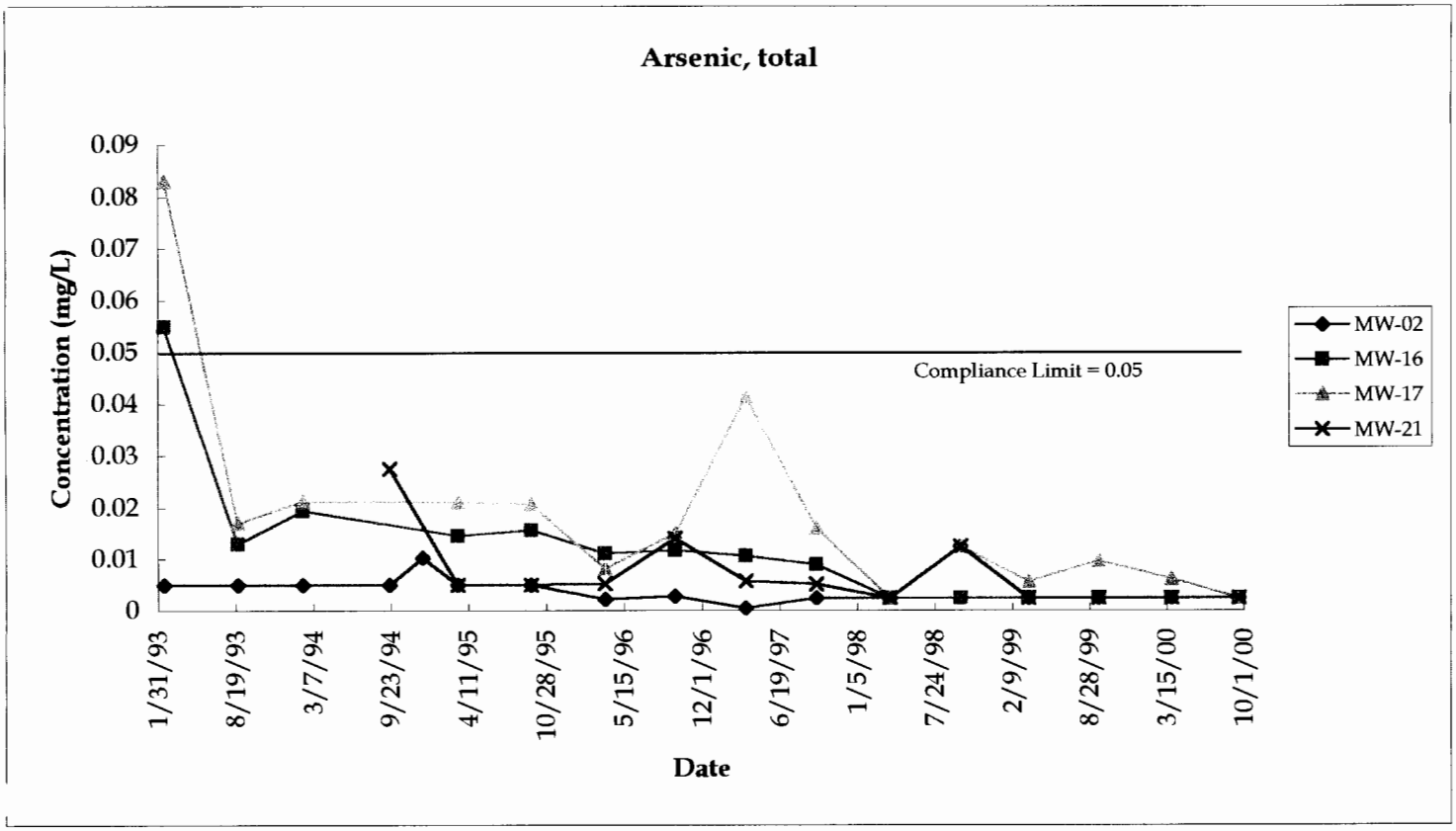


Figure 3-11
Time vs. Concentration Graphs
Supplemental Wells



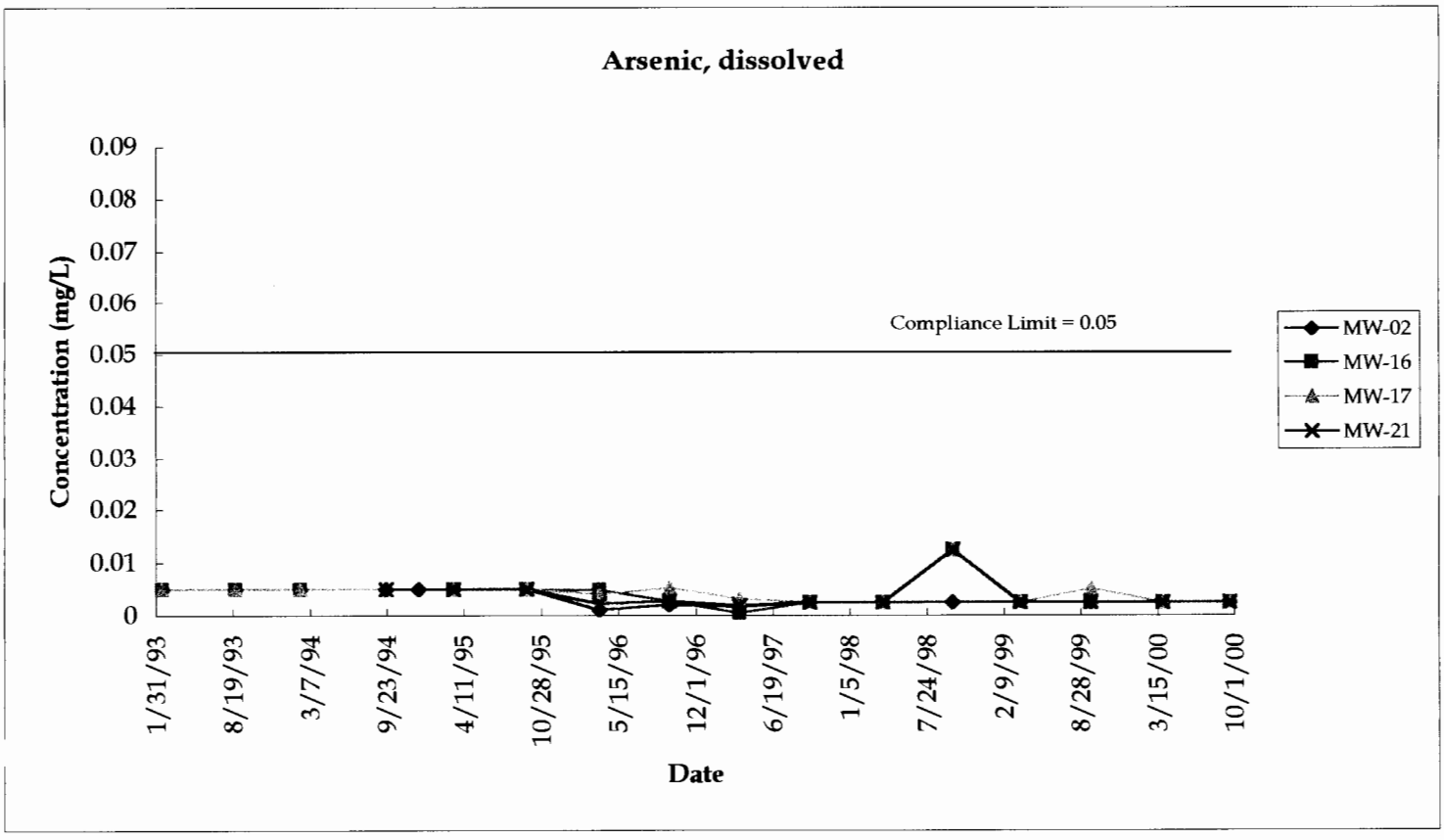
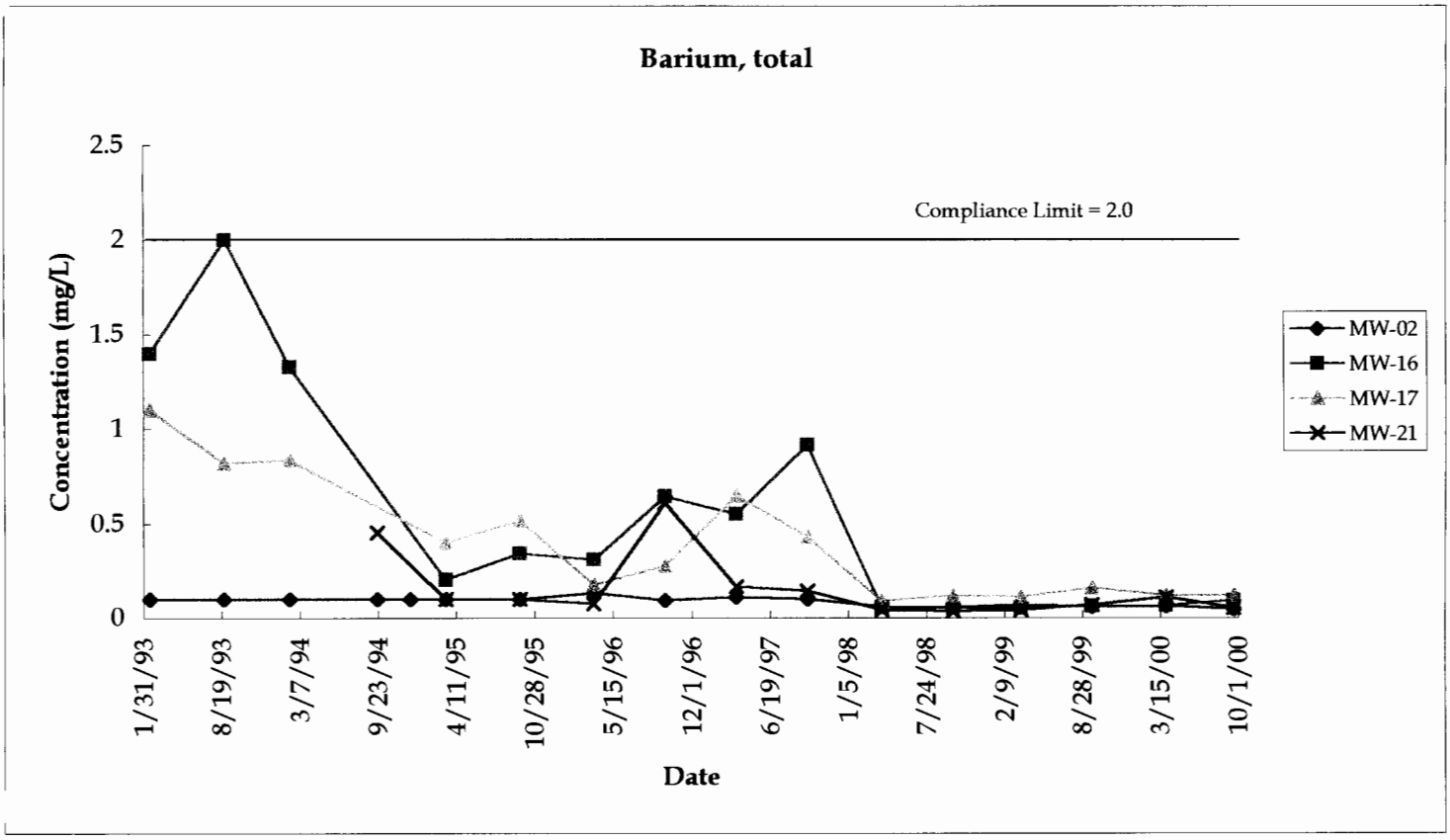


Figure 3-12
Time vs. Concentration Graphs
Supplemental Wells



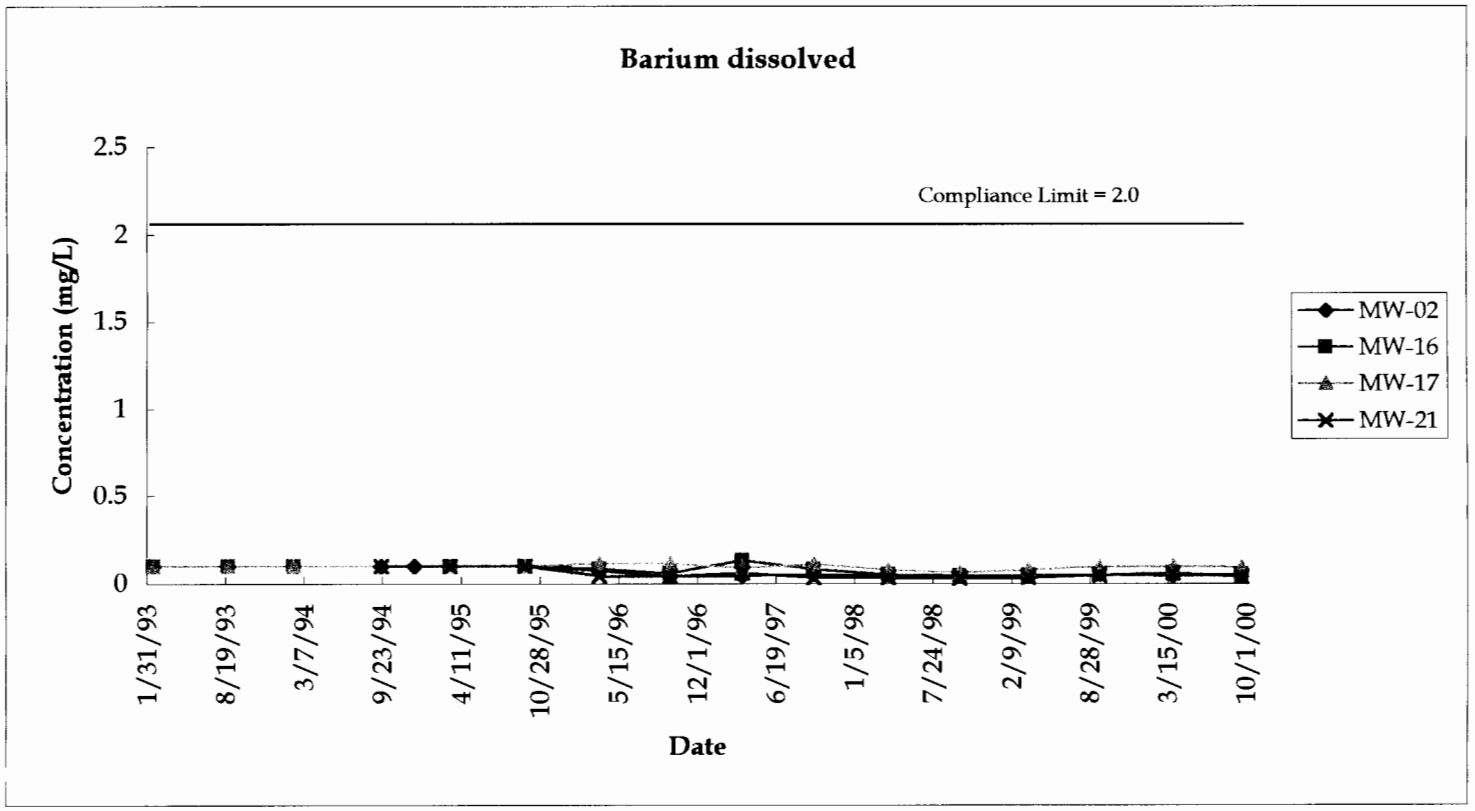
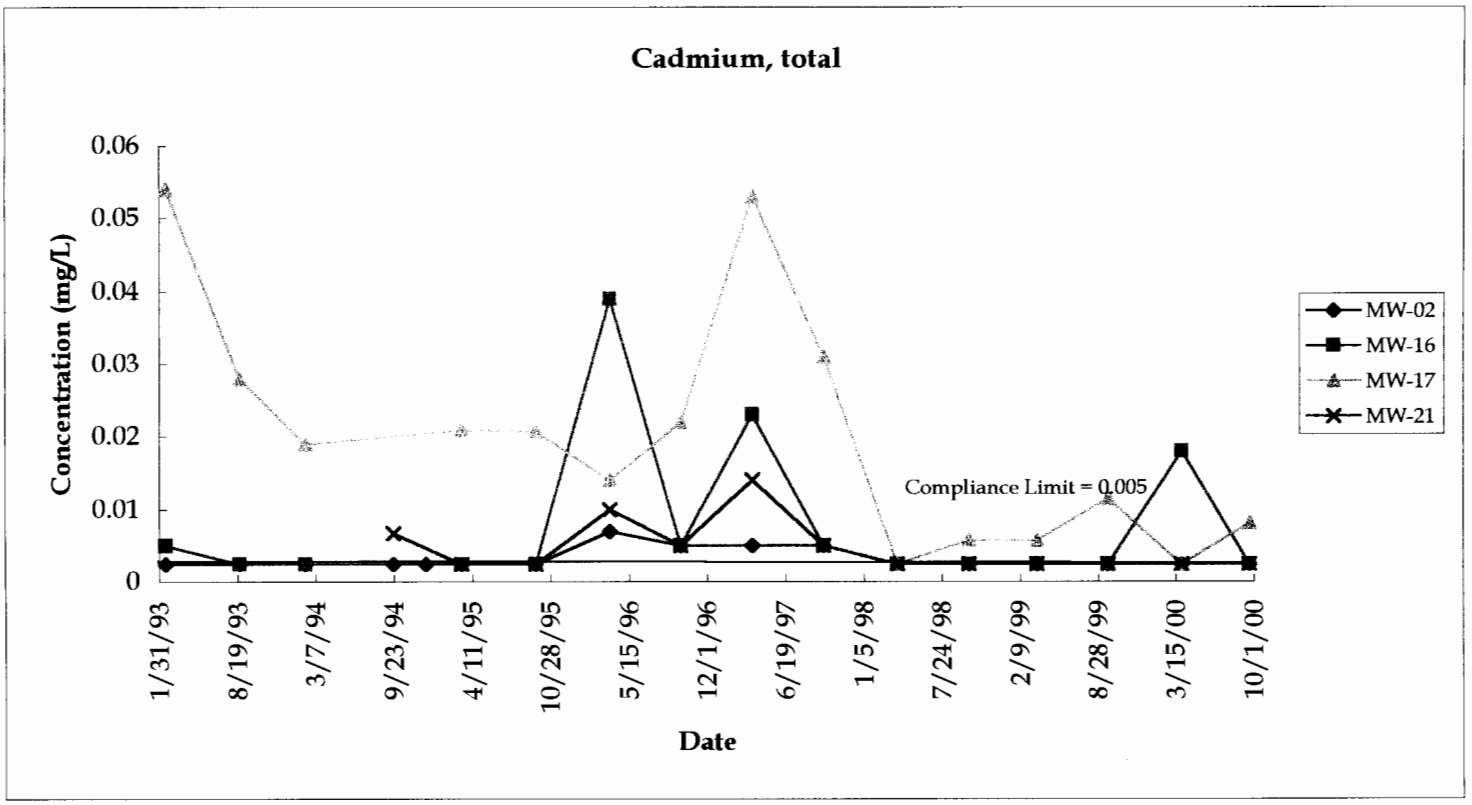


Figure 3-13
Time vs. Concentration Graphs
Supplemental Wells



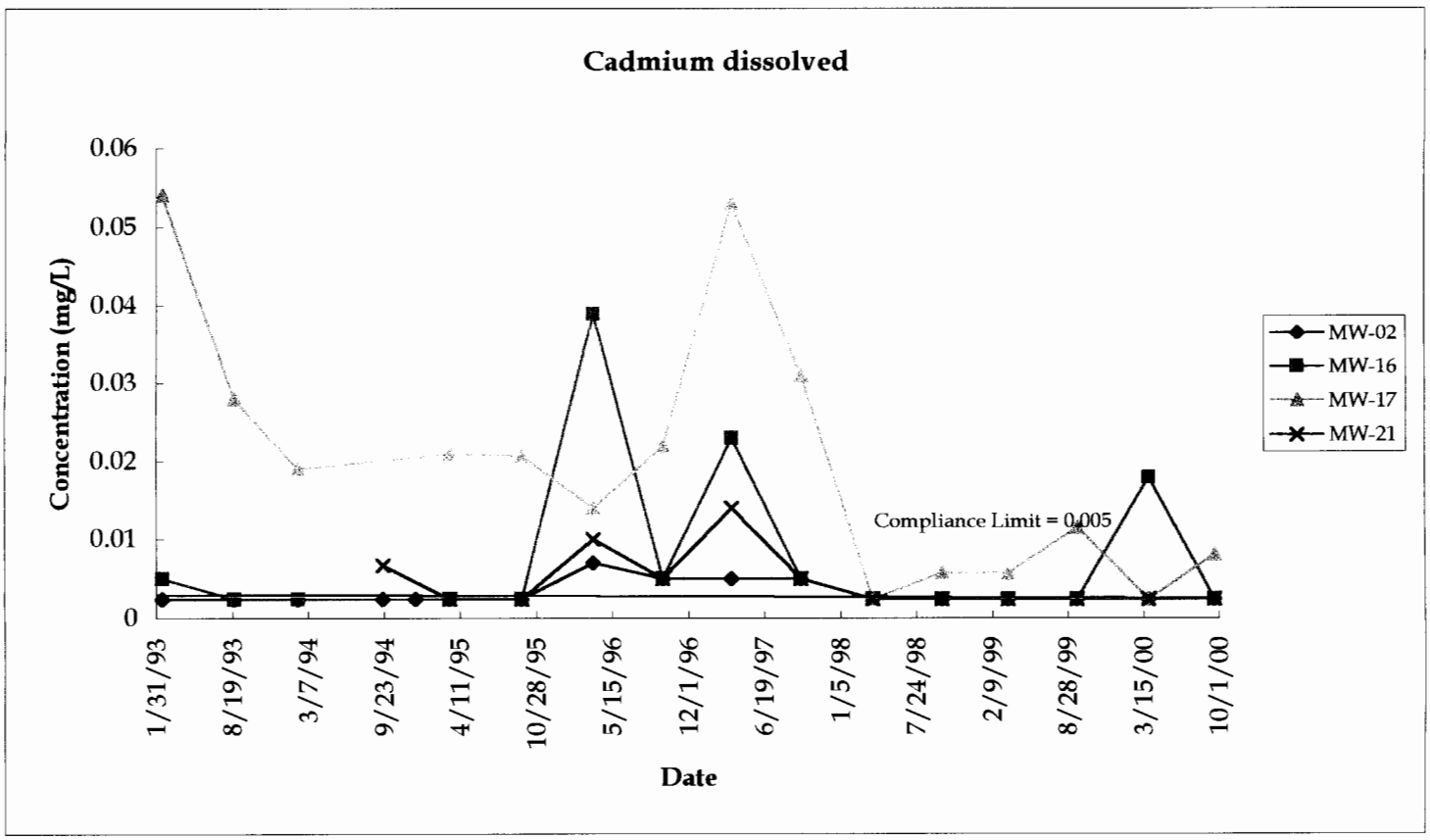
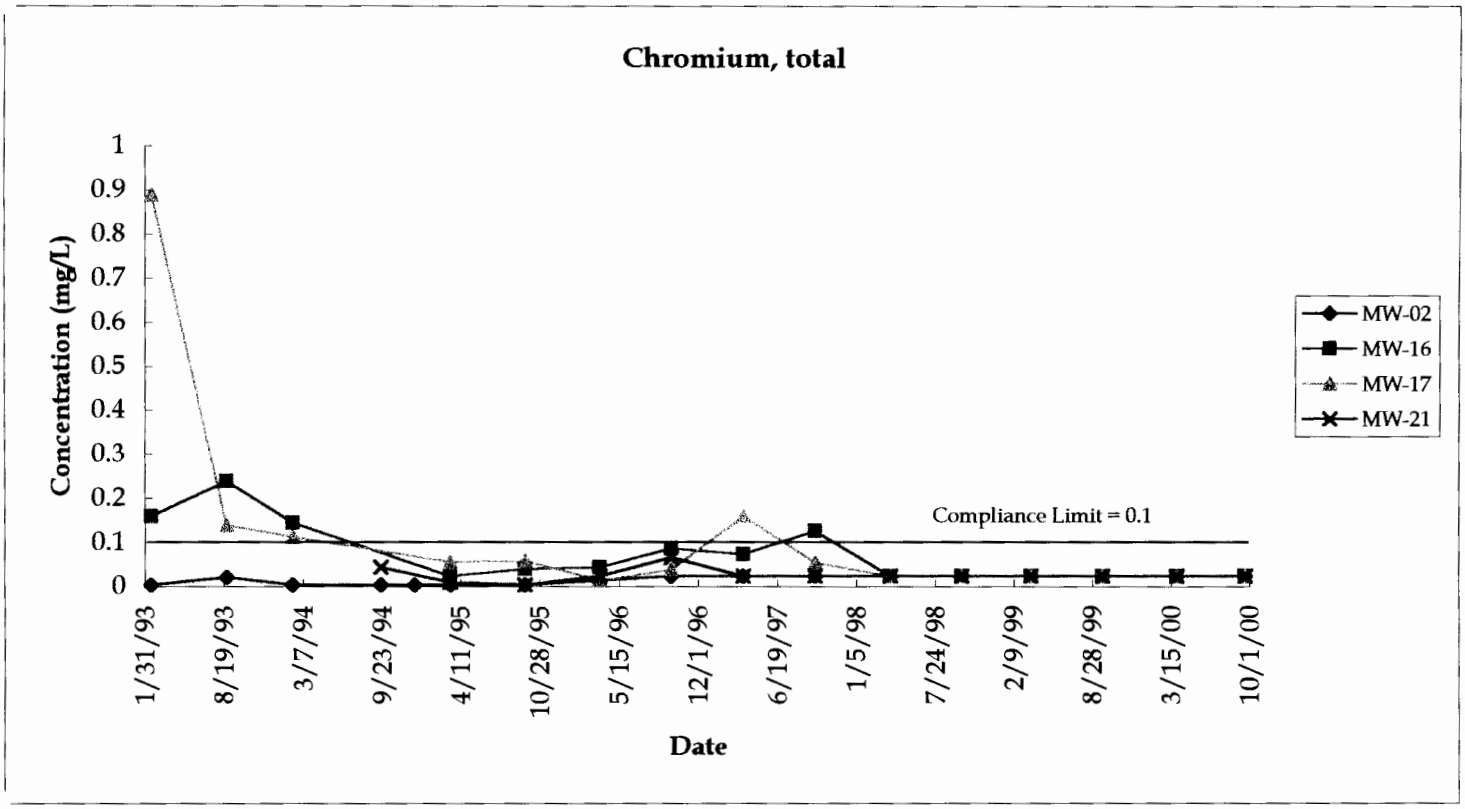


Figure 3-14
Time vs. Concentration Graphs
Supplemental Wells



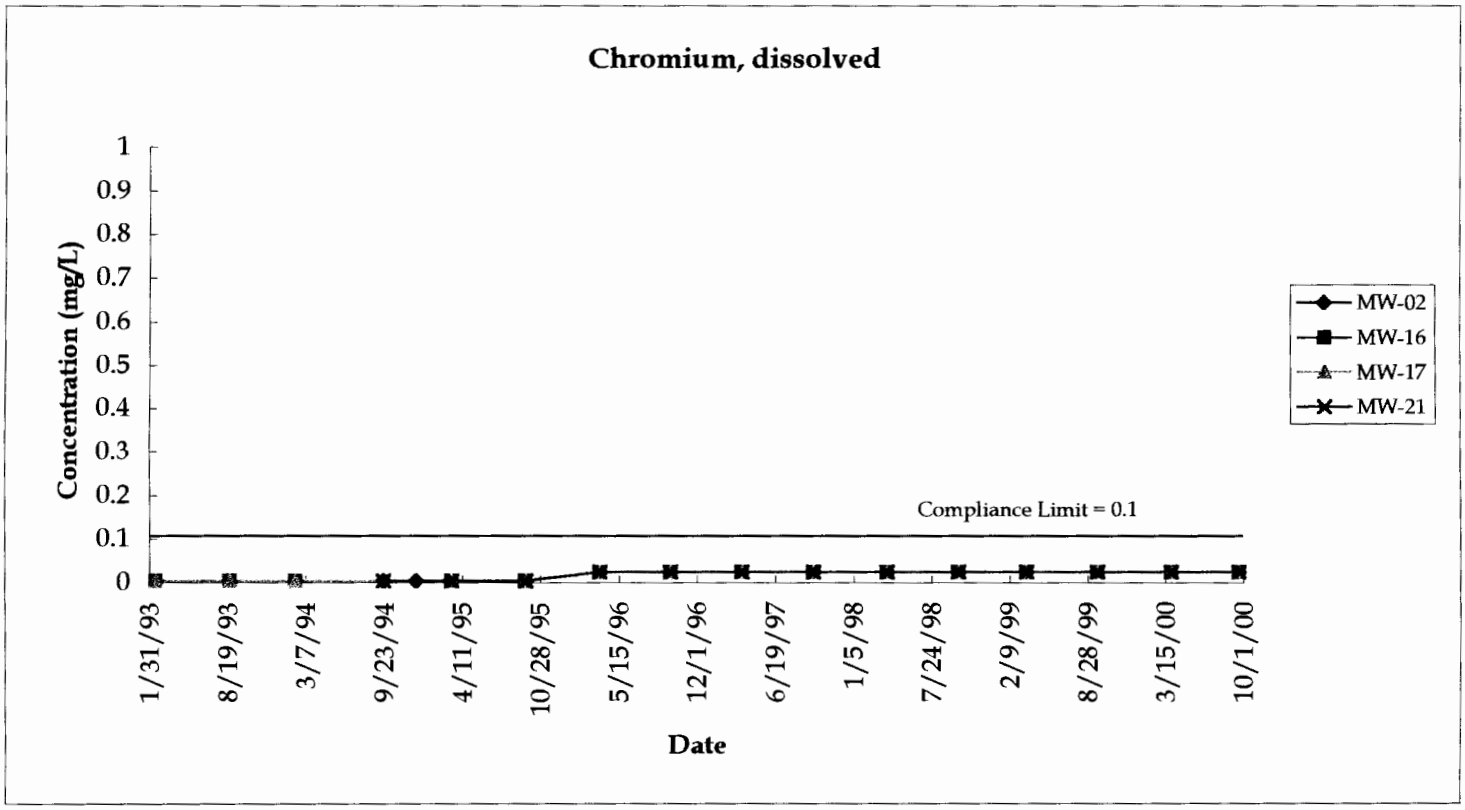
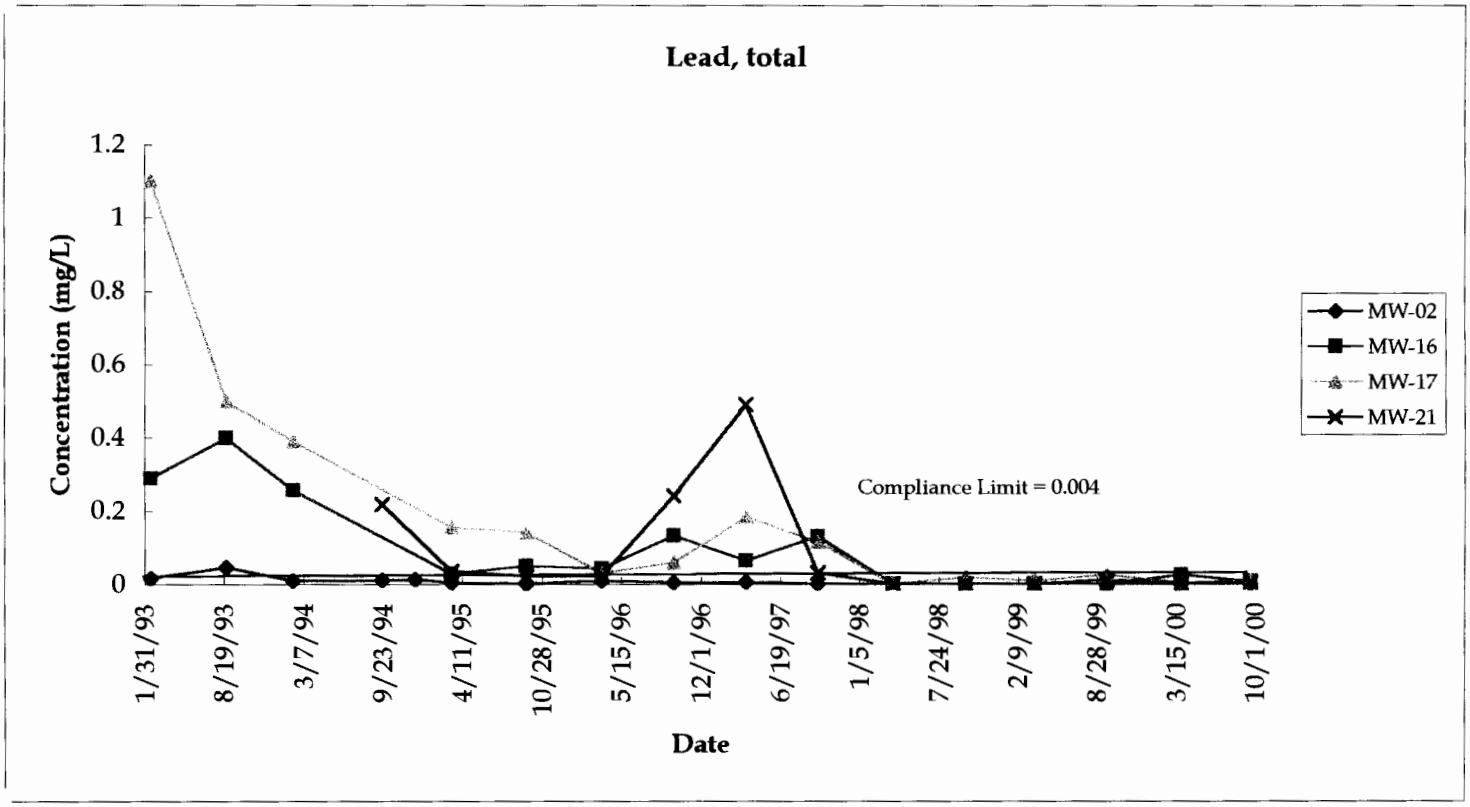


Figure 3-15
Time vs. Concentration Graphs
Supplemental Wells



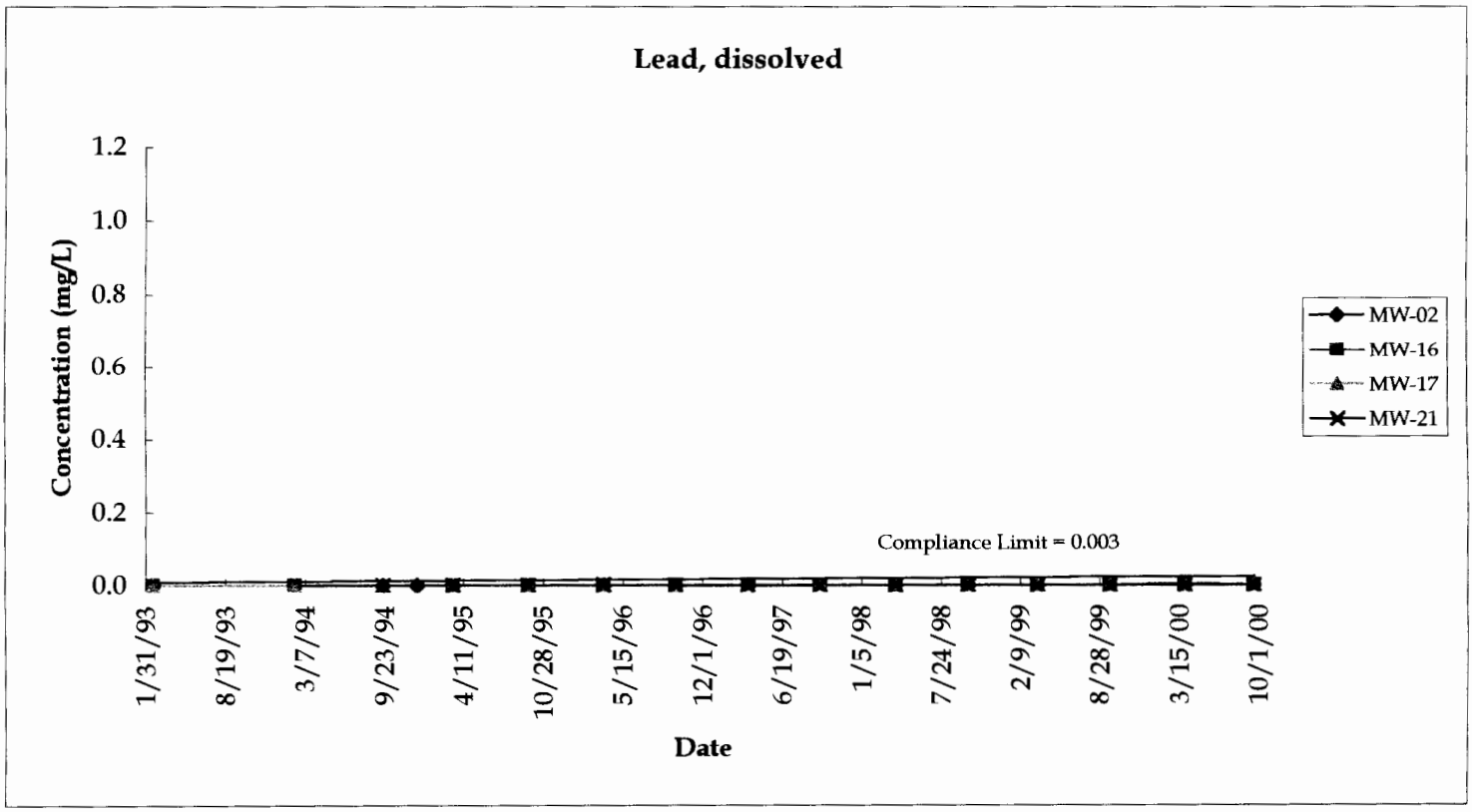


Table 3-1
Compliance Limits
2000 Reporting Period

CONSTITUENT	MCL (mg/L)	MARCH 2000		SEPTEMBER 2000	
		BACKGROUND MEAN (mg/L)	COMPLIANCE LIMIT (mg/L)	BACKGROUND MEAN (mg/L)	COMPLIANCE LIMIT (mg/L)
Arsenic, total	0.05	0.003	0.05	0.004	0.05
Arsenic, dissolved	0.05	0.003	0.05	0.003	0.05
Barium, total	2.0	0.04	2.0	0.04	2.0
Barium, dissolved	2.0	0.03	2.0	0.03	2.0
Cadmium, total	0.005	0.004	0.005	0.003	0.005
Cadmium, dissolved	0.005	0.003	0.005	0.003	0.005
Chromium, total	0.1	0.03	0.1	0.02	0.1
Chromium, dissolved	0.1	0.03	0.1	0.03	0.1
Lead, total	0.015 (1)	0.004	0.004 (2)	0.004	0.004 (2)
Lead, dissolved	0.015 (1)	0.003	0.003 (2)	0.003	0.003 (2)

(1) MCL does not exist for lead. The public water distribution, at the tap, treatment technology action level for lead is 0.015 mg/L.

(2) If an MCL does not exist for a particular constituent, the modified permit requires that the compliance limit be defined as the constituent-specific moving average background concentration.

Table 3-2
Summary of Statistical Testing Results for March and September 2000

CONSTITUENT	SAMPLE LOCATION							
	MW-03	MW-04	MW-06RR[1]	MW-07	MW-08AR	MW-12A	MW-20	MW-21
Arsenic, total	—	—	■◆	—	—	—	—	—
Arsenic, dissolved	—	—	■◆	—	—	—	—	—
Barium, total	—	—	—	—	—	—	—	—
Barium, dissolved	—	—	—	—	—	—	—	—
Cadmium, total	■◆	—	■◆	■◆	◆	■◆	—	■◆
Cadmium, dissolved	—	—	—	—	—	—	—	—
Chromium, total	—	—	■◆	—	—	—	—	—
Chromium, dissolved	—	—	—	—	—	—	—	—
Lead, total	—	■◆	■◆	■◆	—	■◆	—	—
Lead, dissolved	—	—	—	—	—	—	—	—

(1) Includes evaluation of data collected from MW-06R abandoned on August 27, 1998.
■ Statistically exceeds the Compliance Limit for the March 2000 sampling event.
◆ Statistically exceeds the Compliance Limit for the September 2000 sampling event.
— Does not statistically exceed the Compliance Limit.